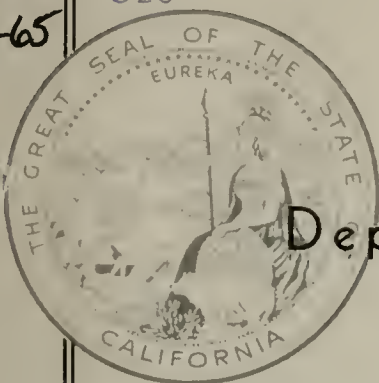


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State of California
THE RESOURCES AGENCY

Department of Water Resources

BULLETIN No. 69-65

CALIFORNIA HIGH WATER 1964-1965

Including A Progress Report On The
California Flood Control Program



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NOVEMBER 1966

HUGO FISHER
Administrator
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EDMUND G. BROWN
Governor
State of California

WILLIAM E. WARNE
Director
Department of Water Resources

State of California
THE RESOURCES AGENCY
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FOREWORD

This Bulletin, the third of an annual series, provides, in one report, information on the meteorology, rainfall-runoff, and damages resulting from the major storms of the 1964-1965 water year. It describes the general weather patterns preceding and during storm periods, including precipitation characteristics; discusses the resulting runoff; and presents information on flooded areas and damages. Tabulations of precipitation comparisons, peak flows and stages, and reservoir operations are included in the appendixes. In addition, a progress report on the current status of the flood control program in California has also been included.

Portions of the information and data appearing in this Bulletin are also contained in two previous Department of Water Resources bulletins, both of which were published following the severe flooding and damages of December 1964 and January 1965. These are: Bulletin No. 161, "Flood!", January 1965, and Bulletin No. 159-65, "California Flood Control Program - 1965", February 1965.

Basic data and information for this Bulletin were supplied by many sources, including the U. S. Weather Bureau, U. S. Geological Survey, U. S. Army Corps of Engineers, U. S. Bureau of Reclamation, and many other agencies, both public and private. Their cooperation is gratefully acknowledged.

The data in this report are considered to be accurate and reliable. However, hydrologic data may be revised (usually the changes are minor) on the basis of subsequent studies and information. Therefore, all data should be considered preliminary and subject to revision.



William E. Warne, Director
Department of Water Resources
The Resources Agency
State of California
September 22, 1966

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December 25, 1964 - The Sacramento Weir, Located on the Sacramento River About 3 Miles Above Its Confluence with the American River, Discharges Excess Flows Through the Leveed Channel at Right into the Yolo Bypass. The City of Sacramento is in the Background.

Pages 59-65:

North Coastal Area - Flood Damages to Residences, Commercial Buildings, Railroads, Highways, and Bridges.

Pages 85-88:

Central Valley Area - Folsom Dam and Reservoir, High Flows and Damage in American River Flood Plain, Oroville Dam Embankment, and Flood Fighting in Sacramento - San Joaquin Delta.

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

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ABSTRACT

The 1964-65 water year was marked by one of the most disastrous floods in California's history, when extremely heavy rainfall produced widespread inundation and damages throughout the northern half of the State in December 1964 and January 1965. Damage was particularly extensive in the North Coast area, exceeding even that caused by the devastating flood of 1955. / The meteorological events of December 1964 were very similar to those of December 1955. A blocking high pressure area, a trough of low pressure, and a strong westerly flow produced a confluence of cold and warm air masses which resulted in heavy and sustained precipitation over a large area. Six-day rainfall amounts of more than 30 inches occurred in the North Coast area, and more than 25 inches in parts of the Central Valley. / The response of streamflows to the heavy warm rains was immediate and intense. Every major river in the North Coastal area produced peak stages and flows exceeding historic maximums. New record peaks were also established on many Central Valley area streams, particularly in the Feather, Yuba, and American River Basins. Total flood runoff was estimated at more than 20 million acre-feet. / Damages resulting from the high levels of runoff and resultant flooding were severe. In the North Coast area, where flood control works are virtually nonexistent, a number of small communities along the Eel and Klamath Rivers were literally wiped out. There was widespread destruction of public and private property, transportation and communication facilities, and utilities. Over 2,000 cases of illness or injury occurred, and there were 24 deaths. Thirty-four counties were proclaimed as disaster areas. Comprehensive surveys by the U. S. Army Corps of Engineers indicate that the total flood damage in California amounted to nearly \$238,000,000. / The extensive flooding and damages which occurred in December 1964 and January 1965 emphasize the need for further flood control projects in California. Specific recommendations for investigation, authorization, and construction of various projects are included in this Bulletin as part of the Progress Report on the California Flood Control Program. / During the remainder of the 1964-65 water year, only moderate runoff occurred, with no significant flooding or damage, although precipitation was generally above normal over the northern two-thirds of the State.

CALIFORNIA HIGH WATER 1964-1965

Meteorology of the December 1964-January 1965 Storm

Synopsis of the December Storm

The flow pattern of the atmosphere over the Northern Hemisphere varies between predominantly zonal flow and predominantly meridional flow. In zonal flow, the streamlines are essentially parallel to the latitude circles, with only minor interchange of polar and tropical air masses. In meridional flow, the streamlines have large amplitude in the north-south direction. During periods of exceptional meridional flow, high pressure centers located at northerly latitudes block the normal meandering westerly flow. Downstream from the blocking high pressure center, there is a trough of low pressure, a feature important for the generation of flood-producing rains. The blocking highs often split the westerly current into two branches, one branch of which flows around the northern periphery of the high and, in turn, becomes the northerly flow into the downstream trough. The second branch breaks through south of the blocking high, transporting warmer air of tropical origin which is in marked contrast to the colder air moving around the north side of the high pressure center. The confluence of the two currents, cold and warm, results in the strong temperature contrasts of a weather front. The persistence of this type of flow pattern over an area produces sustained heavy precipitation.

The weather pattern of December 1964 conformed to the general description given above. A blocking high pressure center had already been present in November over the Bering Sea, and in December this block became more intense and entrenched southwest of Alaska. The downstream trough east

of the block was located over the eastern part of the Gulf of Alaska near the Canadian and Pacific Northwest Coast. Plate 3 shows schematically the flow pattern during the flood-producing rains in the last half of December. The interesting features in this diagram are the blocking high pressure center at longitude 170°W opposite the Alaskan peninsula, the northerly current of cold air flowing southward over the Gulf of Alaska and curving eastward over Washington and Oregon, and the southwesterly current of warm air flowing over southern Oregon and Northern California. The jet stream, oriented WSW-ENE near the confluence of the two currents, was very strong and persistent. The analysis of wind speeds by the National Meteorological Center at the 300-millibar level (about 30,000 feet near the core of the jet) during the 5-day period December 19-23 indicated an average speed of 154 mph (134 knots) at 40°N , 140°W .

The pattern in December 1964 was very similar to that in December 1955. The blocking high and downstream trough were essentially in the same locations, and both storms had the feature of the confluence of the warm and cold air masses. One difference in the two storms was that in the closing phase of the December 1955 storm, the frontal boundary separating the contrasting air masses moved southward to spread heavy rains into the San Joaquin Valley and Southern California. This feature did not occur in the December 1964 storm; instead, the area of heavy rains generally was confined to the area north of San Francisco on the coast and north of Merced in the San Joaquin Valley.

In the following paragraphs the synoptic events are described in more detail with additional charts to illustrate this meteorological event. Plates 4-7 show the 500-millibar charts for December 20, 21, 22, and 23, 1964.

The 500-millibar surface is about 18,000 feet (or 5,500 meters) above mean sea level; this chart depicts the height contours of this pressure surface. The wind flow is essentially parallel to the contour lines and proportional to the spacing of the contours, i.e., high speed with tight spacing and low speed with loose spacing. The four days were chosen to show the meteorological flow pattern on the days of the heaviest precipitation. Also included on these contour charts are the weather fronts taken from the surface weather maps for the same date and time.

On the weekend of December 19 and 20, 1964, a semistationary low was centered off the British Columbia Coast. This low was narrowly separated from a more extended area of low pressure in the Central Pacific by a ridge of high pressure extending southeastward from the Aleutian Islands. A weak southwest flow of moderately moist air over California was bringing some light precipitation to Northern and Central California. The snow level* of the precipitation in the Central Sierra (American River Basin) was about 6,000 feet. Late on Sunday, December 20, the protective ridge collapsed and a migratory low pressure center headed toward the Oregon Coast. This development was to set the stage for the next five days when a strengthened southwest current was to bring a warm, moist air mass to batter the northern half of the State. On the following days a series of migratory low pressure centers moved eastward from the vast mid-Pacific spawning area toward the Pacific Northwest, but the frontal system separating the cold and warm air masses did not penetrate southward into California, except briefly, until

*Snow level (also termed freezing level) here is defined as the level where the precipitation form changes from rain to snow.

Christmas Day. To the south of this front, the south-to-north pressure gradient remained strong. This pressure differential, which is normal to the wind flow, is shown on Plate 8, where the time graph of the pressure difference at sea level between San Francisco and Arcata has been plotted along with the Oakland and Medford 850-millibar wind speeds (about 5,000 feet). On the upper part of the plate is shown the 2-hourly rainfall distribution at Laytonville (this station is located near the heavy rainfall area in the Eel River Basin). This plot illustrates the sustained, strong flow which prevailed for a 3-day period over the North Coast area, as well as the inland areas.

The heavy rains were accompanied by strong, gusty surface winds. Rainfall reports from many stations in open exposures, especially in the North Coast area, indicate that the precipitation catch was deficient due to the strong turbulence accompanying the gale winds. The airport at Arcata reported gusts of 40 to 50 mph; the Eureka office of the U. S. Weather Bureau reported a "fastest mile" speed of 42 mph on December 22, 1955. However, many observers in the field during the heavy rain of December 21 and 22 estimated that gusts in exposed locations were as high as 60 to 70 mph.

On December 26, a wave along the front moved into the Pacific Northwest and began to occlude. The cold front of this system moved southward into California, passing through the North Coast area in the afternoon of December 26 and the lower Sacramento Valley late that evening. The passage of this front ended the warm phase of the December storm.

The cold air pouring southward out of Alaska in the wake of the cold front established a pronounced trough of low pressure, both at the surface (sea level) and aloft, just west of the coastline. The snow level in

the North Coast area lowered to 1,500 feet and in the Central Sierra (east of Sacramento) to 3,000 feet. While the cold air feeding into this trough was unstable and generated numerous showers, including hail, much of the precipitation falling on the already saturated watersheds came as snow.

During the post-frontal cold period of the December storm, snow fell in the mountains, accompanied by strong winds, bringing blizzard-like conditions. This seriously impeded highway travel on the trans-Sierra routes and in the mountain regions of Northwestern California, where rescue operations were being carried out for flood-stricken inhabitants.

Upper Winds (December Storm)

To compare the geographic distribution of orographic rainfall between large storms, it is useful to examine the wind data at levels above ground level. Table 1 shows the wind velocities at the rawin (radar-wind) station at Oakland Airport at the standard pressure levels of 850, 700, and 500 millibars. These pressures are at approximately 5,000, 10,000, and 18,000 feet, respectively. Data are included for two other storms characterized by strong winds, December 1955 and October 1962. (For the November 1950 storm, many wind soundings at Oakland were missing, so this storm was not included.)

Table 1

Comparison of Upper Air Wind Velocities at Rawin Station at Oakland California, in December 1955, October 1962, and December 1964

Dates	Wind Velocity		
	850 mb	700 mb	500 mb
<u>December 18-22, 1955</u>	knots	knots	knots
Average value	38(19)	48(19)	58(17)
Maximum value	66	68	82
Minimum value	17	31	45
<u>October 11-13, 1962</u>			
Average value	44(5)	58(5)	73(4)
Maximum value	54	68	86
Minimum value	29	45	58
<u>December 21-24, 1964</u>			
Average value	36(8)	52(8)	62(8)
Maximum value	45	64	90
Minimum value	21	45	40

Notes: Number in parentheses is the number of soundings.

Upper air wind soundings available as follows:

1955: Four times a day, 0100, 0700, 1300, and 1900 PST; the 0100 PST sounding on 12/22/55 was missing.

1962: Twice a day, 0400 and 1600 PST

1964: Twice a day, 0400 and 1600 PST

A 5-day period was used in the 1955 wind analysis, since strong winds began on 12/18/55.

The data show that, of these three storms, the strongest average wind at Oakland occurred in the October 1962 storm. The winds at Oakland in December 1964 were slightly stronger than those in December 1955 except at the 850 millibar level. Since comparative data are available for only a single station, a more definitive comparison between storms of the wind field over specific river basins has not been made.

Temperature Data (December Storm)

The warmth of the tropical air mass is illustrated by the time plot of the air temperature at two mountain stations, Sexton Summit in Southern Oregon (elevation 3,841 feet) and Blue Canyon in the Sierra Nevada (elevation 5,280 feet). This is shown on Plate 9. The snow level at the warmest period (December 22) was about 9,500 feet in Southern Oregon and 10,500 feet at the latitude of the Central Sierra. Significant also is that the high snow level persisted for several days.

Additional temperature data are available for upper levels at 850 and 700 millibars (about 5,000 and 10,000 feet) at the radiosonde station at Oakland Airport for this and three other storms characterized by high temperatures. These data are given in Table 2.

Table 2

Comparison of Upper Air Temperatures at Radiosonde Station at
Oakland, California, in November 1950, December 1955,
October 1962, and December 1964

Dates	Temperature	
	850 mb	700 mb
<u>November 16-20, 1950</u>	°C	°C
Average value	9.4(10)	1.4(10)
Maximum value	12.0	3.7
Minimum value	6.6	-2.1
<u>December 19-22, 1955</u>		
Average value	9.1(15)	0.1(15)
Maximum value	15.4	6.5
Minimum value	6.3	-3.0
<u>October 11-13, 1962</u>		
Average value	9.1(5)	2.8(5)
Maximum value	10.8	4.8
Minimum value	7.2	0.8
<u>December 21-24, 1964</u>		
Average value	9.4(8)	0.8(8)
Maximum value	12.2	2.5
Minimum value	6.5	-3.8

Notes: Number in parentheses is the number of soundings.

Upper air soundings available as follows:

1950: Twice a day, 0700 and 1900 PST

1955: Four times a day, 0100, 0700, 1300, and 1900 PST; the 0100 PST sounding on 12/22/55 was missing.

1962: Twice a day, 0400 and 1600 PST

1964: Twice a day, 0400 and 1600 PST

Since the snow level was fairly high in all four storms, the comparison is best made for the data at 700 millibars. The October 1962 storm was the warmest, but this was an early-season storm which developed from an old typhoon. The next warmest was the storm of November 1950. However, an individual sounding in the storm of December 1955 (0700 PST 12/22/55) showed the highest temperature. Soundings in 1955 were taken every six hours, permitting a more frequent sampling of the short-period surges of high temperature tropical air. The temperature characteristics of the December 1964 storm were similar to those in December 1955. Although individual surroundings showed higher temperatures in 1955, the overall warmth of the December 1964 storm was slightly greater than that of December 1955.

Further investigation of the frequency, intensity, and duration of warm air masses in winter storms of California appears desirable.

Precipitation Distribution (December Storm)

Plates 41-45 show the isohyetal maps for five areas of the State affected by the December storm: North Coastal, San Francisco Bay, Central Coastal, Northern Lahontan, and Central Valley areas. The period covered by the isohyetal maps is the six-day period, December 18-24 (inclusive). This period was chosen because it includes the period of heaviest rain; also, published data from a large number of supplementary stations throughout Northern and Central California were available for these six days.

During the storm, the North Coast area had more than 30 inches of precipitation in the Eel and Mattole River Basins, and 20 to 30 inches in the Smith, Klamath, Trinity, and Mad River Basins. In the Central Valley,

more than 25 inches of precipitation fell in the area north of Shasta Reservoir and in the Feather, Yuba, Bear, and American River Basins. The storm totals decreased to 15-inch amounts in the Cosumnes, Mokelumne, and Stanislaus River Basins.

The time distribution of the storm precipitation at a number of key hourly precipitation stations is shown on Plates 19-38 of the streamflow hydrographs and reservoir operations. Accumulative precipitation (or mass rainfall) curves are shown on Plates 10-18. These curves illustrate the rapid accumulation of precipitation on December 21 and 22; this was the period when the southwest flow over the Coast Range and Sierra Nevada produced the optimum orographic lifting of the warm, moist air. The relaxation of the flow pattern on December 23 resulted in a decreased rate of accumulation of precipitation.

A comparison of the 1-, 2-, 3-, and 4-day precipitation amounts at 30 representative stations is given in Table 20 in Appendix A. The December 1964 storm values are compared with those of five other large storms: December 1955, February 1958, February 1960, October 1962, and January-February 1963. New records were established by the December 1964 storm at stations in the North Coast area and some stations in the Yuba and American River Basins; however, the records established in the October 1962 storm at stations in the Feather River Basin were not exceeded in December 1964. Also, the December 1955 totals in the Clear Lake area remained unbroken.

Snowmelt During the December Storm

The warm winds and heavy rains melted the snow at low elevations in the mountains. At Blue Canyon in the Sierra Nevada (station elevation 5,280 feet), there were 8 inches on the ground on December 19 and 20, but this was melted by December 21. At Twin Lakes (elevation 7,829 feet), there were 67 inches on the ground on December 20, but this had decreased to 42 inches by December 24. The snowline retreated to about 6,000 feet in most river basins, but it does not appear the snowmelt-runoff added significantly to the flood peaks on December 22. The hydrologists in the Corps of Engineers (Sacramento District) have calculated that in the Yuba River Basin, melting snow added less than one inch to the 15 inches of rain in the basin, but that an additional 1 inch of snowmelt after the peak increased the volume of runoff during the recession period. Similar analysis by hydrologists of the Department of Water Resources indicate that slightly more than 1 inch of snowmelt occurred in the Cosumnes River Basin, where the elevation range of the initial snowpack was from about 3,500 feet to 8,000 feet (top of the basin).

January 1-7, 1965 -- The Second Phase

The cold trough of low pressure which developed off the coast on December 27 continued to maintain itself for the following 10 days. With this semistationary circulation pattern, northerly storm systems moving through the Gulf of Alaska were swept southward into this large trough. One frontal system, which was not significantly active weatherwise when it entered the trough on January 2, began to intensify at longitude 130°W (about 300 miles off the Northern California Coast) and brought a new 5-day

precipitation siege to the Northern and Central part of California. While this storm raised the snow level in the North Coast area from 1,500 to 3,500 feet and in the Sierra Nevada from 3,000 to 5,500 feet, it did not have the extreme warmth of the December storm. Nevertheless, rainfall below the snow level was intense enough to bring new crests to most streams of the Sacramento Valley drainage. Most of the rain fell in the 5-day period ending at 0800, January 7, with maximum values of about 15 inches in the Feather-Yuba Basins, and about 9 inches in the American River Basin. The rainfall extended southward into the Sierra Basins of the San Joaquin Valley. The rainfall was sufficient to bring substantial runoff for the basins from the Mokelumne River south to the Chowchilla and Fresno Rivers. Rainfall amounts in these basins varied from 5 to 6 inches.

Above the snow level, accumulations to the snowpack amounted to 4 to 5 feet. Norden, at elevation 6,900 feet, which reported a snowpack of 20 inches on December 27, had 149 inches by January 7, 1965. Blue Canyon, elevation 5,280 feet, had 1 inch on the ground on December 27 and 70 inches on January 5.

An isohyetal map for the Central Valley covering the 7-day period, January 1-7, 1965, is shown on Plate 46.

Rainfall-Runoff

Streamflows in Northern and Central California ranged from moderate levels to extremely high, record-breaking values during the storms of December 1964 and January 1965. The following paragraphs discuss the rainfall and runoff in the drainage basins of the major areas affected, and also include comparisons with previous maximum peak flows of record and descriptions of major reservoir operations. A general topographic map depicting the major drainage areas in California is shown on Plate 1.

North Coastal Area

The unprecedented floods which peaked on December 22-23 on the Smith River, Klamath River, Redwood Creek, and the Eel River exceeded all previous floods of record. New record flows also occurred in the partially regulated watersheds of the Russian, Trinity, and Mad Rivers, although upstream dams stored portions of the heavy headwater runoff, resulting in attenuated peaks along downstream reaches of these rivers. Only in the small Mattole River Basin did unimpaired runoff result in peak flows and stages less than historic maximums. The high flows and the corresponding heavy runoff volumes resulted primarily from the precipitation which fell on December 21 and 22; but, as could be expected, they were influenced considerably by a procession of antecedent storms which began early in November and continued at regular intervals through the first 11 days of December.

Precipitation over most of the principal watersheds of the North Coast area during November was 150 to 250 percent of normal, with measured amounts ranging as high as 20 inches in the Smith and Eel River watersheds.

Several stations at elevations below 2,000 feet reported light snow as a result of a low freezing level during the second of three storms that occurred during November. Early in December, approximately 2 to 6 inches of rainfall from two minor storms were recorded in the basins north of the Russian River. During the second December storm, the freezing level as determined by the Medford, Oregon, upper-air soundings appears to have been situated around the 8,000-foot elevation in the more mountainous northern basins of the North Coast. Thus, in the six weeks following November 1, a series of five storms pushed through this region depositing moderate amounts of rainfall, which established a relatively high level of soil moisture in the North Coast basins. Following December 11, the freezing level dropped to as low as 2,000 feet and for the next eight days fluctuated continuously between this level and 6,000 feet. This essentially describes the general pattern of events in the North Coast area that led up to the devastating floods throughout the region.

On December 19, following seven days of low upper-air temperatures, the freezing level began to rise slowly and light intermittent rainfall began, continuing through December 20 and resulting in 1 to 6 inches of rainfall at various locations in the North Coast. At the start of this rainfall there was very little flow in any of the North Coast rivers. As an example, in the Eel River at Alderpoint, a discharge of only 2,000 cfs at a stage of 4.9 feet was flowing past the gage on the morning of December 19.

A few hours before midnight, December 20, a 6- to 12-hour period of heavy precipitation resulted in 7 to 8 inches of rainfall from the headwaters of the Russian River north to the Smith River Basin. Following six hours of light precipitation, another prolonged period of heavy precipitation began

around 6 p.m. and lasted about 24 hours, during which more than 20 inches of rain was measured. During these two periods of precipitation, the freezing level rose rapidly to over 8,000 feet. The response of the rivers to this second period of precipitation was immediate, with rates of rise in excess of 1.0 foot per hour occurring at many locations. The previously noted Eel River at Alderpoint rose from 4.9 feet at 6 a.m., December 19, to a maximum of 87.2 feet around 8 p.m. on December 22 -- a rise of over 82 feet in 86 hours.

In general, the daily pattern of storm rainfall was similar on all basins in the North Coast -- light intermittent rainfall on December 19 and 20 followed by two days of extremely intense rainfall. The rainfall on December 21 and 22 was primarily responsible for the tremendous flows, but this excessive runoff was certainly abetted by the high soil moisture conditions resulting from the rainfall from the antecedent storms during the previous 50-day period. Analysis of available data indicates that snowmelt contribution was not significant during peak runoff periods.

In the text which follows, the rainfall and runoff in each of the principal basins within the North Coast are discussed separately. Selected rainfall reports and computed peak runoff events are listed for each basin and, where possible, for primary tributaries within a basin. Locations of North Coastal area precipitation and stream gaging stations are depicted on Plate 41, and selected streamflow and reservoir hydrographs are illustrated on Plates 19-24.

Smith River Basin

The Smith River drains a total gaged area of about 609 square miles in the extreme northwestern corner of the State. Throughout its length, the Smith River flows through the rugged, slide-prone Klamath Mountains except for the final 15 miles, where it slices through the Coast Range and crosses a broad coastal plain before emptying into the Pacific.

Precipitation in November was greater than normal in the Smith River Basin, and later, in the first 11 days of December, two periods of precipitation resulted in rainfall totals up to ten inches. As a consequence, basin moisture conditions had increased considerably since November and became favorable for a high degree of runoff.

On December 18, before the storm began, the estimated stage in the Smith River near Crescent City was about 4 feet with an estimated discharge of 3,500 cfs. After December 18, when the storm entered the basin, two days of precipitation of 4 to 6 inches did not result in any significant increase in flows -- only increased basin moisture conditions. On December 21, a short heavy burst of rainfall was followed by a prolonged period of extremely heavy rainfall which continued through the 22nd and resulted in very high runoff and record flows and stages throughout the basin. At the Smith River near Crescent City stream gage, which was destroyed during the flood, the peak discharge on December 22 was estimated to be about 228,000 cfs, from a high water mark of 48.5 feet. The previous maximum stage and discharge of record, which occurred in 1955, were 41.2 feet and 165,000 cfs. Rainfall totals and peak runoff values for the Smith River Basin are listed in Tables 3 and 4.

Table 3

Rainfall Totals for the December Storm
Smith River Basin

Precipitation Station	Rainfall Period (Inclusive)	Rainfall Total (Inches)
Crescent City 7ENE	19-27	18.71
Idlewild Highway Maintenance Station	19-27	33.88
Elk Valley	19-27	35.87

Table 4

Selected Peak Runoff Events
Smith River Basin

Stream Gaging Station	Drainage Area (Sq. Mi.)	Peak Stage (Feet)	Peak Discharge (cfs)	Dec. 19-27 Runoff Volume		
				SFD*	Acre-Feet	Inches**
Smith River near Crescent City	609	48.5	228,000	435,000	862,000	26.5

*SFD = Second Foot Days (1 SFD is the volume of water represented by a flow of 1 cubic foot per second for 24 hours).

**Inches of runoff is the depth to which the drainage area would be covered if all the runoff for a given time period were uniformly distributed on it.

In addition to the heavy flooding in the delta region and overflow into Lake Earl, massive slides occurred throughout the basin, the largest of which reportedly covered over 40 acres and occurred in the South Siskiyou Fork Basin about 13 miles due east of Gasquet. As a result of the many slides, observers at downstream points along the Middle Fork Smith River reported frequent fluctuations in river stages, which were often preceded by increased sediment load in the flood waters.

Average annual precipitation at rain gages in the Smith River Basin exceeds that of any other basin in California; and not surprisingly, the

35.87 inches measured at Elk Valley for the December 19-27 storm period was the greatest within the State. During the entire month of December, the total precipitation was 47.82 inches -- second only to the 48.07 inches recorded at Branscomb 2NW, located in the South Fork Eel River Basin.

Klamath River and Tributary Basins

At the small Indian community of Weitchpec, situated at the confluence of the Trinity and Klamath Rivers, reliable high water marks which date back more than 100 years to the flood of 1861-62 indicate that the December 1964 flood was the greatest of record in the Klamath watershed. Peaks above the 1955 maximums did not occur on the regulated main stem of the Trinity River between Trinity Dam and Burnt Ranch solely because the storage space available behind the dam easily impounded the 415,000 acre-feet of upstream runoff.

The tremendous runoff in the Klamath watershed was generated by a rainfall pattern which in intensity and duration was somewhat less than that which occurred in the Eel and Smith River Basins. Up to December 19, recorded rainfall totals were generally less than 3 inches; but, as elsewhere in the North Coast area, light intermittent rainfall persisted through the 19th and 20th of December on basins which had attained a relatively high soil moisture content. On December 21 and December 22, the heavy precipitation which trailed the light amounts of the previous two days produced extremely high flows in the Klamath, Shasta, Scott, and Salmon Rivers, and the unregulated portions of the Trinity River. Generally, these peak flows occurred in the ten-hour period from 6 p.m., December 22 to 4 a.m., December 23.

Representative rainfall totals for the Klamath River and its tributary basins are listed in Table 5. They indicate that heavier precipitation occurred in the western regions of the Trinity River Basin, particularly in the South Fork Trinity River.

Table 5
Rainfall Totals for the December Storm
Klamath River and Tributary Basins

Precipitation Station (Basin)	Observation Time	Rainfall Period (Inclusive)	Rainfall Total (Inches)	Rainfall Period (Inclusive)	Rainfall Total (Inches)
Callahan R.S.* (Scott River)	5 p.m.	19-26	11.91	21-22	7.51
Happy Camp R.S. (Klamath River)	3 p.m.	19-26	18.05	21-22	8.40
Sawyers Bar R.S. (Salmon River)	8 a.m.	19-26	12.89	22-23	7.09
Orleans R.S. (Klamath River)	5 p.m.	19-26	18.89	22-23	9.94
Trinity Dam Vista Pt. (Upper Trinity R.)	8 a.m.	19-26	10.87	22-23	5.96
Big Bar R.S. (Trinity River)	8 a.m.	19-26	12.91	22-23	7.04
Forest Glen (So. Fk. Trinity R.)	8 a.m.	19-26	24.51	22-23	12.50
Hoopa (Lower Trinity R.)	8 a.m.	19-26	21.68	22-23	14.23

*R.S. = Ranger Station

In the upper Klamath River immediately below Iron Gate Dam, peak flows were almost twice as high as previous maximums despite the regulation provided by the series of upstream dams and reservoirs. Downstream from Iron Gate Dam, high tributary flows also occurred from the Shasta and Scott Rivers. These high flows, supplemented by heavy runoff farther downstream, combined to produce a flow of 165,000 cfs at the Seiad Valley stream gage, surpassing the previous peak discharge of 122,000 cfs in 1955.

Unprecedented heavy runoff also occurred from the tributaries below Seiad Valley, the largest of which is the Salmon River, causing a peak stage at the Klamath River gage near Somesbar 16 feet above the previous high water mark. This high flow, which destroyed the gage, was estimated to be about 307,000 cfs, compared with the 202,000 cfs which occurred in December 1955. Reports received after the flood indicate that the instantaneous peak flow at the Klamath River near Somesbar gage may have been affected by an extremely large slide that temporarily blocked the Salmon River in the vicinity of Lewis Creek. The slide apparently occurred around 11 p.m., December 22, shortly after the Salmon River peaked. No information is available to determine the height to which water was impounded at the slide except that, at a bridge two miles upstream, the river stage increased by about 15 to 20 feet. Even today the Salmon River has not yet regained its former channel as it twists around a 700-foot-long mass of material piled 150 feet in and above the original channel.

In the Trinity River above Trinity Dam, all upstream runoff was stored in the reservoir as the storage rose 415,000 acre-feet from its prestorm level to 1,902,400 acre-feet by midnight, December 27 -- equivalent to 10.5

inches of runoff from the contributing area above the dam. Peak inflow to Clair Engle Lake was estimated at 84,000 cfs; in contrast, releases during the 9-day period averaged under 250 cfs. Stages at downstream points along the main stem Trinity River upstream from Salyer reflected the absence of any significant contribution from above Trinity Dam, as peak stages during the heavy runoff period were somewhat less than historic maximums.

Despite the benefits provided by Trinity Dam, excessive contribution from major tributaries, including the New River and the South Fork Trinity River, resulted in record stages on the lower Trinity River near Hoopa as the discharge reached a peak of 231,000 cfs at a corresponding stage of 40.3 feet. The previous maximum stage and discharge of record, which occurred in 1955, were 36.9 feet and 190,000 cfs. About 13 miles below this gage, at the confluence of the Klamath and Trinity Rivers, a stage 19.5 feet above the 1955 peak and 13.7 feet above the 1861-62 peak was observed by the residents of Weitchpec.

At Klamath Glen near the mouth of the Klamath River, a record peak discharge of 557,000 cfs was estimated from the 55.3 foot stage that occurred at the inundated gage around 3 to 4 a.m., December 23. The former peak stage and discharge at this location were 49.7 feet and 425,000 cfs in the flood of December 1955.

Peak runoff events for the Klamath River and tributary basins are listed in Table 6. To be more representative, runoff volumes in inches for the Klamath River do not include the Shasta River Basin nor the area of the Klamath River Basin above the confluence of the Shasta and Klamath Rivers.

Table 6

Selected Peak Runoff Events
Klamath River and Tributary Basins

Stream Gaging Station	Drainage Area (Sq. Mi.)	Peak Stage (Feet)	Peak Discharge (cfs)	Dec. 19-27 Runoff Volume		
				SFD	Acre- Feet	Inches
Scott River near Fort Jones	653	25.34	54,600	126,000	250,000	7.2
Klamath River at Somesbar	2,560 ^a	76.5	307,000	1,034,000	2,050,000	15.0
S.F. Trinity River near Salyer	898	47.6	95,400	239,000	474,000	9.9
Trinity River near Hoopa	2,129 ^b	40.3	231,000	614,000	1,220,000	10.8
Klamath River near Klamath	5,462 ^{a,b}	55.3	557,000	1,867,000	3,703,000	12.7

a. Adjusted to exclude Shasta River Basin and portion of Klamath River Basin above the confluence with Shasta River.

b. Adjusted to exclude basin above Trinity Dam.

Redwood Creek Basin

The 278-square-mile watershed of Redwood Creek is characteristic of many of the basins within the North Coast area with its long, narrow configuration and general north-south alignment. Redwood Creek has no major tributaries and, except for the town of Orick which straddles the creek near the mouth, the basin is sparsely populated. Overbanking in and around the community of Orick has occurred six times in the last 12 years.

Antecedent precipitation over the watershed during November was around 12 inches and later, through the first 11 days of December, was around

10 inches. From 2 a.m. to 2 p.m. on December 21, slightly under 3 inches of rainfall was recorded at the rain gage near O'Kane, which resulted in a minor rise at both stream gages in the basin. Following a 6-hour period of no rainfall during which minor peaks were observed at the stream gages at Orick and near Blue Lake from the previous rainfall, an uninterrupted 36-hour period of heavy rainfall began. Within hours, the recessions then in progress were reversed as the small creek responded to the heavy runoff. At the Redwood Creek near Blue Lake gage, a peak stage of 16.05 feet was recorded, with a corresponding instantaneous peak discharge of 16,400 cfs. About 40 miles downstream at Orick, residents witnessed their third major flood in 11 years as the river crested at 24.0 feet. The corresponding discharge was 50,500 cfs. At both stream gage sites, the flows and stages exceeded previous maximum recorded levels.

At the O'Kane rain gage, adjacent to the Blue Lake river gage, the measured rainfall during the 9-day period from December 19 to December 26 was 24.9 inches, while the runoff volume past the stream gage for the 10-day period (December 19-27) was approximately 32.5 inches. Since the measured rainfall was somewhat less than the runoff for a nearly comparable period, apparently heavier precipitation occurred in ungaged upstream areas of the basin.

Peak runoff events for the two basin gages are listed in Table 7.

Table 7

Selected Peak Runoff Events
Redwood Creek Basin

Stream Gaging Station	Drainage Area (Sq. Mi.)	Peak Stage (Feet)	Peak Discharge (cfs)	Dec. 19-27 Runoff Volume		
				SFD	Acre- Feet	Inches
Redwood Creek near Blue Lake	67.5	16.05	16,400	58,900	117,000	32.5
Redwood Creek at Orick	278	24.0	50,500	183,000	362,000	24.4

Mad River Basin

The Mad River flows through a long, narrow basin having a total drainage area of about 497 square miles. The river has no major tributaries, although downstream flows are affected by 51,800-acre-foot Ruth Reservoir, the only major storage facility within the watershed. On December 18, before the precipitation started, only 3,000 acre-feet of storage capacity (equivalent to 0.5 inch of runoff) was available in Ruth Reservoir. As a result of the runoff generated by the 6 to 7 inches of rainfall that occurred on December 19 and 20, the reservoir was filled and spillage began over the 100-foot-wide, ungated spillway on December 20.

On December 20, 21, and 22, during the peak rainfall periods, runoff above Ruth Dam was apparently very heavy. This runoff caused the pool elevation of the reservoir to rise rapidly until around 8 p.m. on December 22, when a reported peak overflow depth of about 19 feet occurred. Undoubtedly, Ruth Reservoir attenuated flows and stages in the downstream reaches, since the

reservoir was holding in temporary storage about 24,000 acre-feet at the time of peak overflow.

About 9 miles downstream from Ruth Dam, a comparatively moderate peak flow of about 20,100 cfs at a stage of 16.8 feet occurred at the Mad River near Forest Glen stream gage around 5 p.m. on December 22. The highest stage recorded at this gage took place on December 22, 1955, before the dam was built, when the river crested at 24.5 feet (39,200 cfs).

Near the mouth of the Mad River at the gage near Arcata an estimated peak flow of 70,400 cfs at a stage of 23.4 feet occurred around 2 a.m., December 23. The record peak stage and flow at this gage are the 27.3 feet and 77,800 cfs of December 1955.

Tables 8 and 9 show various rainfall and runoff values in this basin. As in other basins, most of the runoff resulted from rainfall on and before December 22. After December 23, reports were received of heavy snowfall down to low elevations, marking the end of the rainfall period which generated the high flows in the Mad River watershed.

Table 8

Rainfall Totals for the December Storm
Mad River Basin

Precipitation Station	Observation Time	Rainfall Period (Inclusive)	Rainfall Total (Inches)	Rainfall Period (Inclusive)	Rainfall Total (Inches)
Bridgeville 4NNW	8 a.m.	19-26	21.73	22-23	10.81
Forest Glen	8 a.m.	19-26	24.51	22-23	12.50
Mad River R.S.	8 a.m.	19-26	25.02	22-23	14.77
Blue Lake 8NE	8 a.m.	19-24	18.68	21-22	11.05
Bridgeville	8 a.m.	19-26	17.59	21-22	9.66

Table 9

Selected Peak Runoff Events
Mad River Basin

Stream Gaging Station	Drainage Area (Sq. Mi.)	Peak Stage (Feet)	Peak Discharge (cfs)	Dec. 19-27 Runoff Volume		
				SFD	Acre- Feet	Inches
Ruth Dam	119	2673.0	--	55,100*	108,000	17.2*
Mad River near Forest Glen	143	16.8	20,100	69,200	138,000	18.1
Mad River near Arcata	484	23.4	70,400	220,200	440,000	17.1

*Estimated from daily observations at spillway.

Eel River Basin

The greatest computed peak discharge ever recorded within the Eel River Basin, an unprecedented 752,000 cfs, occurred in response to an extremely heavy and prolonged period of rainfall. Throughout the Eel River Basin, the recorded intensity and duration of rainfall exceeded that of any other watershed within the North Coastal drainage system, with the exception of the Smith River Basin. Practically every mainstream U. S. Geological Survey stream gaging station within the basin was destroyed or inundated during the high water period.

The Eel River Basin drains about 3,625 square miles within the Coastal Mountain range. The main stem Eel River has four large tributaries which contributed heavy flows during the December storm runoff period. Only

one dam of consequence, Scott Dam, has been constructed within the basin; it is located near the headwaters of the Eel River north of Clear Lake.

Throughout the basin, light precipitation began on December 18 and continued intermittently through the next two days until a total of about 2 to 3 inches of rainfall was recorded. Just before midnight of December 20, a 12-18-hour burst of rainfall began, amounting to about 4 to 6 inches. The rain was accompanied by high winds which continued through the remainder of the storm. The runoff generated by this rainfall initiated minor rises at upstream points, but the primary effect was to increase the basin moisture to near-saturation levels. After a brief 6-hour period of light rainfall, heavy sustained precipitation began over the basin and continued for over 24 hours. The effect of this rainfall was immediate, and rises in excess of 1.5 feet per hour were occurring during the morning of December 22 at many points within the stream system. The general north-south orientation of the basin and its 5,000- to 7,000-foot-high primary ridges induced optimum orographic lifting in the eastward heading storm and resulted in heavy rainfall simultaneously over the entire basin.

Table 10 lists rainfall totals for selected precipitation stations at various points along major tributaries and the main stem Eel River. The heaviest reported rainfall occurred at Branscomb 2NW, Cummings, and Richardson Grove State Park -- all within the South Fork Eel River drainage basin. The corresponding runoff volume from the South Fork Eel River has been computed to be in excess of 42 inches from the basin above the Branscomb gage and 31 inches from the basin above the Miranda gage. As in the case of the Redwood Creek Basin, these rain gages did not adequately indicate the heavy rainfall over portions of the basin.

Table 10

Rainfall Totals for the December Storm
Eel River Basin

Precipitation Station	Observation Time	Rainfall Period (Inclusive)	Rainfall Total (Inches)	Rainfall Period (Inclusive)	Rainfall Total (Inches)
Potter Valley P.H.	4 p.m.	19-26	19.65	21-22	12.26
Covelo	8 a.m.	19-26	16.79	22-23	11.04
Alderpoint	9 a.m.	19-26	18.48	22-23	10.35
Lake Mountain	12 Mid.	19-26	22.82	21-22	15.26
Branscomb 2NW	8 a.m.	19-26	35.67	22-23	17.26
Cummings	5 p.m.	19-26	34.25	21-22	18.04
Richardson Grove State Park	8 a.m.	19-26	30.42	22-23	18.53
Scotia	8 a.m.	19-26	12.06	22-23	7.35

Within Lake Pillsbury, the reservoir behind Scott Dam, only 16,400 acre-feet of storage (equivalent to 1.05 inches of runoff) was available at the start of the storm for impounding runoff. By early December 21 the reservoir was filled, and spillage estimated at 6,400 cfs was occurring by 4 p.m. The next day at around 6 p.m. a peak discharge of 56,300 cfs at a depth of about 11 feet was occurring over the spillway. At the gage downstream from the dam, the same flow resulted in a stage of 24.24 feet. In December 1937, the previous maximum of record, the discharge was 41,100 cfs at a stage of 22.9 feet. At Van Arsdale Dam, 8 miles downstream, a peak flow of about 64,100 cfs occurred at 7:30 p.m., December 22, compared with the former peak of 48,600 cfs in 1955.

By holding 22,700 acre-feet of runoff in temporary storage, Lake Pillsbury definitely attenuated peak flows in the upper Eel. However, inflow to the river between the dam and the gaging station above Dos Rios was so heavy that the discharge increased to 184,000 cfs at this gage, which was overtopped and destroyed during the high water. Several miles below the gage, heavy contribution estimated at over 160,000 cfs from the first large and important tributary, the Middle Fork, pushed the discharge up to 460,000 cfs at the Eel River below Dos Rios gage. The gage itself was inundated as the river crested at 62.5 feet at around 6 p.m., December 22 -- considerably above the 1955 record stage of 49.86 feet and flow of 283,000 cfs.

The second major tributary of the Eel, the North Fork, peaked at 133,000 cfs; and as the flows swept into the canyon of the main Eel, peak discharges in excess of 500,000 cfs began occurring as indicated by the gage at Alderpoint, where the river rose from the prestorm stage of 4.9 feet and 2,300 cfs on December 18 to an unprecedented 87.2 feet and 561,000 cfs at 8 p.m. on December 22. By comparison, the 1955 record stage and discharge were 72.5 feet and 376,000 cfs. This gage was inundated and partly destroyed.

Along the more highly populated South Fork Eel River, the heavy runoff generated a crest near Miranda of 46.0 feet at a corresponding discharge of 199,000 cfs. The river crested at about 6 p.m. on December 22. This gage was also inundated and severely damaged.

As the flow from the South Fork joined the main channel of the Eel, 25 miles downstream from the gage near Miranda, extremely heavy damage was occurring at many small communities along the South Fork and along the

main Eel below the confluence. There was widespread flooding within the many low-lying communities during the morning of December 22.

At the basin's downstream gage located at Scotia, a peak discharge of 752,000 cfs was estimated from the 72.0-foot crest that took place around 2 a.m., December 23. The previous recorded maximum occurred nine years earlier on December 22, 1955, when the Eel River peaked at 61.9 feet with a corresponding discharge of 541,000 cfs.

The Van Duzen River, the fourth major tributary of the Eel River, and which joins the Eel several miles below Scotia, peaked at 48,700 cfs on December 22. Immediately below its confluence with the Van Duzen, the Eel River flows out of the canyon, passes by the Sandy Prairie levee, and spreads out over a broad coastal plain before entering the Pacific Ocean. The two-mile-long Sandy Prairie levee, which protects right bank developments south of Fortuna and near Rohnerville, was completely overtopped along its entire length. Farther downstream, at the bridge located at Fernbridge in the delta, the river crested at around 29.5 feet, 1.8 feet above the 1955 maximum.

Selected peak runoff events for various stream gaging station in the Eel River Basin are listed in Table 11.

Table 11

Selected Peak Runoff Events
Eel River Basin

Stream Gaging Station	Drainage Area (Sq. Mi.)	Peak Stage (Feet)	Peak Discharge (cfs)	Dec. 19-27 Runoff Volume		
				SFD	Acre- Feet	Inches
M.F. Eel near Covelo	367	31.7	133,000	309,000	610,000	31.2
Eel below Dos Rios	1,484	62.5	460,000	1,029,000	2,040,000	25.8
Eel at Alderpoint	2,079	87.2	561,000	1,248,000	2,480,000	22.2
S.F. Eel near Miranda	537	46.0	199,000	452,000	900,000	31.2
Eel at Scotia	3,113	72.0	752,000	2,147,000	4,250,000	25.6

Based on over 50 years of stage and discharge records at the Eel River at Scotia gage, studies indicate the December 1964 flood had an approximate recurrence interval of about 175 years -- that is, another flood of this magnitude can be expected to be equalled or exceeded, on the average, once in 175 years.

Mattole River Basin

This 240-square-mile watershed, which is sandwiched between the Pacific Ocean and the lower Eel River Basin, was subjected to very heavy rainfall during the storm period (December 19-26), as typified by the 28.11 inches measured at Honeydew 2WSW.

The runoff in the Mattole River resulting from this rainfall, although high, did not exceed the historical maximums established during the December 1955 flood. At the gaging station near Petrolia, a peak discharge of 78,500 cfs at a stage of 27.86 feet occurred just before noon on December 22. The 1955 record peak stage and discharge were 29.6 feet and 90,400 cfs. The runoff volume for December 19-27 was about 330,000 acre-feet -- equivalent to about 25.8 inches.

Russian River Basin

The Russian River flows generally southward, through a drainage basin of about 1,340 square miles. The southernmost of the North Coast basins, this watershed has only one major dam -- Coyote Dam -- located in the headwaters near Ukiah on the East Fork Russian River. This Corps of Engineers' facility has a gross pool capacity of 122,500 acre-feet (less surcharge) within its reservoir, Lake Mendocino.

Although rainfall amounts in the Russian River Basin were generally less than in the other North Coast basins, heavy flooding occurred in many parts of the watershed. The amount of rain which fell in the headwater was substantially higher than that which fell in the downstream regions, with the result that record-breaking flows swept out of the small East Fork Russian River Basin and poured into Lake Mendocino. As a consequence, storage within the flood control reservoir increased from 70,800 acre-feet on December 19 to a maximum of 129,250 acre-feet by late December 24. All upstream runoff was stored and no releases were made from Coyote Dam during the heavy runoff period until stages downstream near Guerneville settled below the danger level.

Postflood studies indicated that the peak stages in the Russian River below Coyote Dam were reduced by as much as 2 feet. In contrast, peak inflow to Lake Mendocino was 21,000 cfs -- some 7,700 cfs more than the December 1955 peak flow, prior to construction of the dam.

Downstream, on the Russian River near Hopland, a peak flow of 41,500 cfs (26.01 feet) occurred around 7 p.m., December 22; about 4 p.m. the next day, a peak of 71,300 cfs (27.00 feet) occurred at the gage near Healdsburg. The former (1955) record peak flow at Healdsburg was 67,000 cfs.

Below Healdsburg, at Mark West Creek, high flows from the Russian River were backing up into Mark West Creek and into the Laguna de Santa Rosa -- a natural depression near Sebastopol -- causing heavy flooding in this agricultural bottomland. In the Russian River near Guerneville, a peak discharge of 93,400 cfs on December 22 exceeded the 1955 flow of 90,100 cfs. Tables 12 and 13 show various rainfall and runoff values in this basin.

Table 12

Rainfall Totals for the December Storm
Russian River Basin

Precipitation Station	Observation Time	Rainfall Period (Inclusive)	Rainfall Total (Inches)	Rainfall Period (Inclusive)	Rainfall Total (Inches)
Potter Valley P.H.	4 p.m.	19-26	19.65	21-22	12.26
Ukiah	5 p.m.	19-26	16.58	21-22	10.41
Hopland Largo Station	8 a.m.	19-26	12.01	22-23	7.71
The Geysers	12 Mid.	19-26	20.44	21-22	13.03
Healdsburg	6 p.m.	19-26	12.59	21-22	8.35
Guerneville	8 a.m.	19-26	10.72	22-23	6.45

Table 13

Selected Peak Runoff Events
Russian River Basin

Stream Gaging Station	Drainage Area (Sq. Mi.)	Peak Stage (Feet)	Peak Discharge (cfs)	Dec. 19-27 Runoff Volume		
				SFD	Acre- Feet	Inches
E.F. Russian River near Calpella	93	20.21	18,700	33,000	65,600	13.2
Russian River near Hopland	362	26.01	41,500	108,000	214,000	11.1
Russian River near Healdsburg	793	27.00	71,300	206,000	408,000	9.7
Russian River near Guerneville	1,340	49.6	93,400	304,000	602,000	8.4

Runoff Volume - North Coast

The total runoff volume from the December 1964 storm, as measured at each basin's downstream gage, is shown in Table 14. It indicates the greatest runoff per basin area took place in the Mattole, Eel, and Smith River Basins, with the lowest runoff in the Russian River. Since a number of the downstream gages were inundated, damaged, or destroyed, the corresponding runoff volumes in some locations are only approximate. The total runoff from the seven listed basins during the indicated runoff period was about 10.8 million acre-feet.

Table 14

North Coast Runoff Volumes

Drainage Basin	Drainage Area (Sq. Mi.)	December 19-27 Runoff Volume	
		Acre-Feet	Inches
Smith River	609	862,000	26.5
Klamath River	5,462	3,940,000	13.5
Redwood Creek	278	362,000	24.4
Mad River	484	440,000	17.1
Eel River	3,113	4,250,000	25.6
Mattole River	240	330,000	25.8
Russian River	1,340	602,000	8.4

San Francisco Bay Area

Streamflows in the San Francisco Bay area ranged from high levels in the drainage basins north of the Bay to lesser values at East Bay, South Bay, and Peninsula locations. Many peak discharges were recorded during the December storm period, while others occurred later, in early January, as a result of moderate to heavy rainfall over wetter basins. Locations of precipitation and stream gaging stations in this area are shown on Plate 42.

North of San Francisco Bay, runoff was fairly high at most locations from the 5- to 15-inch rainfall amounts of December 18-24. The major stream in this area, the Napa River, recorded a flow of 11,700 cfs at the gage near St. Helena on December 22, and 10,500 cfs downstream near Napa on the following day. Two weeks later, on January 5, the additional rainfall produced even

higher discharges at these locations. At St. Helena, a peak of 11,800 cfs occurred, compared with the high of 12,600 cfs in 1955; and near Napa, a flow of 14,300 cfs compares with the maximum of 16,900 cfs in 1963. On the same day, several smaller creeks in this region registered new peak flows of record: Walker Creek near Tomales had 4,340 cfs, exceeding the 3,430 cfs of 1961, 1962, and 1964; and Redwood Creek near Napa peaked at 1,450 cfs, surpassing the 1,330 cfs of 1963.

East Bay, South Bay, and Peninsula area streams had generally moderate flows as typified by the following: Walnut Creek at Walnut Creek peaked at 4,200 cfs on January 5, compared with the high of 12,200 cfs in 1958. Alameda Creek near Niles had a flow of 5,320 cfs on December 23, much less than the record maximum of 29,000 cfs in 1955. In Patterson Creek at Union City, the discharge was 4,580 cfs on December 23, in contrast to the 10,500 cfs of 1963. The gage on Pescadero Creek near Pescadero recorded 3,310 cfs on January 5, compared with the 9,420 cfs of 1955.

Central Coastal Area

In contrast to the North Coast area, only low to moderate runoff occurred in the streams of the Central Coastal area, well below any previous maximum flows of record. At many locations, peak discharges in early January were higher than those of the December storm, as a result of the additional rainfall in combination with wet basins and increased base flows. Locations of precipitation and stream gaging stations in this area are depicted on Plate 43.

The following are typical examples of the magnitude of flows in the Central Coast basins: The San Lorenzo River at Big Trees peaked at 8,450 cfs, compared with the record high of 30,400 cfs in 1955. The Pajaro River at Chittenden had a flow of 3,300 cfs, far below the maximum of 24,000 cfs in 1955. The Nacimiento River near Bryson Registered 11,700 cfs, compared with the 30,300 cfs of 1955. The Salinas River near Bradley recorded 4,720 cfs, compared with the peak of 28,400 cfs in 1958. Arroyo Seco near Soledad had a discharge of 7,700 cfs, in contrast to the 28,300 cfs of 1958. Arroyo de la Cruz near San Simeon peaked at 6,680 cfs, compared with the high of 17,700 cfs in 1955. All the above peak flows occurred during the period January 5-7.

Central Valley Area

Runoff in the major rivers and tributary streams of the Central Valley area ranged from extremely high values in the Sacramento Valley to moderate levels in the southern San Joaquin basins. Many new peak flows of record were established during the period December 22-26, with several others occurring during the second storm phase early in January. Locations of Central Valley area precipitation and stream gaging stations are depicted on Plates 44 and 46; hydrographs of selected streams and reservoirs are illustrated on Plates 25-37; and plots of gage heights on the Sacramento and tributary river systems are shown on Plates 39 and 40.

Sacramento River and Tributary Basins

In the drainage area above Shasta Dam, flows in the Pit and McCloud Rivers and Squaw Creek were moderately high, while the Sacramento River at Delta had a flow of 38,800 cfs, exceeding the previous maximum of 37,000 cfs in 1955. These streams combined to produce a peak reservoir inflow of 187,100 cfs on December 22, second only to that of 201,000 cfs in 1955. During the period December 20-27, storage in Shasta Reservoir increased 795,000 acre-feet. Downstream at Keswick Dam, the maximum regulated return discharge to the Sacramento River was held to 50,000 cfs.

In the reach of the Sacramento River from Redding to Red Bluff, several west-side tributary streams had new peak flows of record. Clear Creek at French Gulch had 7,600 cfs, surpassing 7,050 cfs in 1955; and Cottonwood Creek near Cottonwood registered 56,500 cfs, compared with 52,300 cfs in 1941. These and other locally heavy inflows to the river produced a peak of 170,000 cfs at the gaging station near Red Bluff on December 22. This was the highest flow registered at this location since the construction of Shasta Dam.

Valley tributary flows on December 22-23 were also very high in the area south from Red Bluff to the vicinity of Chico. On the west side, Thomas Creek at Paskenta had a flow of 37,800 cfs, exceeding that of 23,500 cfs in 1955. Stony Creek near Fruto, between Stony Gorge and Black Butte Reservoirs, peaked at 40,200 cfs, compared with the previous high of 36,000 cfs in 1909. On the east side, Butte Creek near Chico reached a new maximum of 21,200 cfs, compared with 18,700 cfs in 1955.

Below Red Bluff on the Sacramento River, the gaging station at Vina Bridge had a peak discharge of 162,000 cfs on December 23, compared with the previous high of 147,000 cfs in 1958. Further downstream, flows entering the

Sacramento River Flood Control Project were somewhat less than project design amounts, principally due to extensive overbank flows between Red Bluff and Ord Ferry. At Butte City, for example, a peak discharge of 126,000 cfs occurred on December 24, compared with the project design flow of 160,000 cfs at this location. Substantial overflows in this area into Butte Basin and Sutter Bypass from Moulton, Colusa, and Tisdale Weirs commenced on December 22 and continued for various periods of time. Maximum stages and discharges over these weirs and lengths of overflow periods are listed in Table 15.

The extremely heavy rainfall amounts of the December storm period produced record-breaking flows in the Feather, Yuba, and American River Basins. In the Feather River Basin, Spanish Creek above Blackhawk Creek at Keddie peaked at 15,400 cfs, exceeding the previous peak of 15,000 cfs in 1963. The North Fork Feather at Pulga had a peak flow of 73,000 cfs, compared with 72,400 cfs in 1955. On the West Branch Feather River near Paradise, the discharge of 25,500 cfs topped the previous high of 21,200 cfs in 1963. The Middle Fork Feather River near Merrimac recorded a new maximum of 86,200 cfs, considerably above the 65,400 cfs of 1963.

At the Oroville Dam site, these high flows combined on December 22 for a record peak of approximately 253,000 cfs inflow into the reservoir temporarily impounded by the dam embankment under construction. This flow compares with the 203,000 cfs 5 miles downstream at Oroville during the flood of 1955, and to the previous high of 230,000 cfs established in 1907. On December 23, the maximum storage behind the embankment reached approximately 155,000 acre-feet, which resulted in a peak discharge of 158,000 cfs through the two diversion tunnels below the embankment.

The reduction of the peak discharge provided by the storage behind Oroville Dam was a significant factor in lessening the flood threat to the vulnerable Marysville-Yuba City area, at the confluence of the Feather and Yuba Rivers. This was particularly important because of the record high flows in the Yuba River occurring simultaneously with those of the Feather. The gaging station on the Yuba River at Marysville peaked at 180,000 cfs, compared with the previous high of 160,000 cfs in 1955. In contrast, the Feather River at Yuba City had a maximum stage of 76.42 feet, 6 feet lower than the peak stage of 1955, when a tragic levee break resulted in the loss of 38 lives.

In the Yuba River Basin, very high runoff occurred on December 22. The North Yuba River below Bullards Bar Dam reached 91,600 cfs, surpassing the flow of 83,000 cfs in 1963. Oregon Creek near North San Juan, a tributary of the Middle Yuba River, peaked at 10,300 cfs, almost double the previous high of 5,390 cfs in 1955. On the South Yuba River at Jones Bar near Grass Valley, a maximum of 53,600 cfs topped the former peak of 40,000 cfs in 1963. These high flows joined to produce a record discharge of 171,700 cfs downstream at the gaging station on the Yuba River at Englebright Dam. The previous maximum at this location was 150,000 cfs established in 1963.

Further south, in the American River Basin, record streamflows also resulted from the very heavy and widespread precipitation. At Blue Canyon, for example, nearly 20 inches of rain fell in the 3-day period December 21-23. On the North Fork American River at North Fork Dam, the peak discharge of 65,400 cfs exceeded the former high of 59,700 cfs in 1963. The Middle Fork American River near Auburn had an extremely high flow of 250,000 cfs

on December 23, far surpassing the previous maximum of 121,000 cfs in 1963. This record discharge was the result of high natural runoff combined with a flood wave caused by the failure of the partially completed Hell-Hole Dam, under construction some 50 miles upstream on the Rubicon River, a major tributary of the Middle Fork. On the South Fork American River near Kyburz, a new peak flow of 17,400 cfs topped the previous high of 15,500 cfs in 1963.

Due to the surge of water caused by the Hell-Hole Dam failure, inflow to Folsom Reservoir rose sharply to 280,000 cfs on the afternoon of December 23 after having previously peaked at 214,000 cfs earlier that morning. Storage in the reservoir increased by 322,000 acre-feet during December 20-23 despite high outflows from Folsom Dam, which were controlled to a maximum of 115,000 cfs for 50 hours.

The high flows on the Sacramento River and its major tributaries, together with those of the Sutter Bypass, combined to produce substantial overflow into the Yolo Bypass at Fremont Weir and also necessitated opening all 48 gates of the Sacramento Weir. On December 25, the Yolo Bypass near Lisbon had an estimated peak flow of 350,000 cfs, compared with the previous high of 304,800 cfs in 1955. Total peak flow past the latitude of Sacramento, including the Sacramento River and the Yolo Bypass, was estimated to be 450,000 cfs. Thus, the Sacramento River Flood Control Project passed the greatest peak flows in its history without a major levee break.

Maximum stages and discharges over project weirs and duration of overflow periods are shown in Table 15.

Table 15

Sacramento River Flood Control Project
Weir Overflow Data

Weir	Beginning of Overflow		Overflow Period (Hours)	Peak Stage (Feet) and Discharge (cfs)	
	Date	Time			
Moulton	12/22/64	2000	204	82.42	25,800
	1/4/65	1530	165	82.14	23,600
Colusa	12/22/64	1520	758	68.10	69,600
	1/24/65	1605	237	63.2 ^e	5,200 ^e
	4/10/65	0200	33	63.64	8,300
Tisdale	12/22/64	1830	1,246	49.73	24,600 ^e
	4/10/65	0615	55	47.46	6,050
	4/20/65	0620	98	47.20	4,700
Fremont (West End)	12/22/64	2000	1,053	39.53	248,000
	4/21/65	0600	102	34.62	9,200
<u>1/</u> Sacramento	12/23/64 <u>2/</u>	0310 <u>2/</u>	218 <u>3/</u>	32.30	85,300

e = estimated

1/ Movable crest type weir

2/ First bay opened

3/ Last bay (except damaged one) closed 1/1/65 at 0445

In the Sacramento-San Joaquin Delta area, heavy inflows combined with high tides and wind to produce a series of high water levels extending well into January. The gaging station on the Sacramento River at Rio Vista recorded a peak stage of 8.83 feet on December 26 and 27, compared with the peak of record of 10.2 feet in 1955.

In addition to the heavy December runoff, some locations in the Sacramento Valley also had high peak discharges in early January. Although rainfall during the storm period January 2-7 was not as intense as that in December, nevertheless, in combination with already wet basins and high base flows, it produced fairly substantial amounts of runoff. On January 5, the

Sacramento River near Red Bluff had 137,000 cfs, compared with the previously noted 170,000 cfs on December 22. On the same day, several new peak flows of record were established as follows: Red Bank Creek near Red Bluff had a maximum of 12,200 cfs, surpassing 5,770 cfs in 1963; Elder Creek at Gerber had 14,100 cfs, compared with 11,000 cfs in 1958; and Big Chico Creek near Chico peaked at 9,850 cfs, exceeding the 8,260 cfs of 1937. Further south, Cache Creek above Rumsey registered 59,000 cfs, considerably above the previous high of 26,700 cfs in 1963.

On Putah Creek, inflow to Lake Berryessa reached 79,100 cfs, also on January 5, having previously peaked at 72,000 cfs on December 22. Storage in this reservoir increased by 332,000 acre-feet from December 20 to January 7, when it filled and discharged a maximum of 7,300 cfs through the "glory hole" spillway. Prior to spilling, a controlled outflow of only 10 cfs to Putah Creek below Monticello Dam had been maintained during the period of heavy runoff elsewhere.

During December 21-January 11, an estimated runoff volume of about 8.6 million acre-feet entered the Sacramento-San Joaquin Delta and Suisun Bay from the Sacramento River and its tributary basins, including the Yolo Bypass.

Minor rises also took place in the Sacramento River system during April, causing overflows at Colusa, Tisdale, and Fremont Weirs, as noted in Table 15.

San Joaquin River and Tributary Basins

The principal tributaries of the San Joaquin River -- the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, and Merced Rivers -- all recorded high flows in their upper basins during the December 22-26 storm period. All of these streams, with the exception of the Cosumnes River, have reservoirs which were generally effective in storing a large amount of this rainfall-runoff before the waters reached the valley floor. Early in January, when additional rainfall occurred and the flood retention capacity of most of these reservoirs had been depleted, increased releases combined with local runoff to produce moderately high stages and flows in the San Joaquin River.

On the upper Cosumnes River, the unimpaired runoff resulted in high peak discharges, slightly smaller than the maximum flows of record of December 1955. At the Michigan Bar gaging station, a peak of 37,500 cfs occurred on December 23, compared with the 42,000 cfs of 1955. At downstream points, however, lesser peaks were the result of overbank flows from the vicinity of Sloughouse to the confluence of the Cosumnes and Mokelumne Rivers. The gage at McConnell, near Highway 99, registered 32,200 cfs, compared with the high of 54,000 cfs in 1955.

High flows were recorded in the Mokelumne River above Pardee and Camanche Reservoirs on December 23 and 24. Cole Creek near Salt Springs Dam, an upper tributary, had a new record peak of 6,140 cfs, exceeding the 5,730 cfs set in 1963. Downstream, the Mokelumne River near Mokelumne Hill recorded 29,700 cfs, only slightly below the 33,700 cfs established in 1950. This heavy runoff was adequately contained by the joint operation of the two reservoirs, which had a combined storage increase of 193,000 acre-feet during

December 20-29. Return flow to the river from Camanche Dam was held to only 150 cfs until December 30, when it was increased to 3,000 cfs, well within downstream channel capacity.

The Calaveras River and other smaller streams in the Stockton area, including Mormon Slough and Littlejohn, Duck, and Bear Creeks had fairly high flows in the December storm, although somewhat below previous peaks of record. On December 23, New Hogan Reservoir on the Calaveras River recorded a peak inflow of 20,600 cfs, while Farmington Reservoir on Littlejohn Creek registered 18,100 cfs. Downstream releases from both these reservoirs were controlled to nondamaging levels.

Heavy rains in the Stanislaus River Basin on December 23 and 24 produced high inflow peaks to Donnell's and Beardsley Reservoirs on the upper Middle Fork and to Melones and Tulloch Reservoirs downstream. Melones Reservoir had an inflow of 48,700 cfs on December 23, with a second peak of 43,400 cfs the following day. The storage capacity of these reservoirs was rapidly depleted during the storm period, and on December 24 both Melones and Tulloch filled and spilled, with a maximum outflow to the river of 40,800 cfs. Downstream, the gaging station at Ripon registered a peak of 32,800 cfs on December 25, compared with the record maximum of 62,500 cfs of 1955. Two weeks later, on January 7, additional rainfall-runoff again caused Tulloch Reservoir to fill and spill, with a discharge to the river of 14,400 cfs.

In the Tuolumne River Basin, heavy flood runoff from the headwaters and upper tributaries was stored in Cherry Valley, Lake Eleanor, and Hetch-Hetchy Reservoirs during the December storm period. Downstream at Don Pedro Reservoir, separate inflow peaks took place on consecutive days, similar to those of the Stanislaus River. The inflow of 44,000 cfs on December 23 was

followed by a lesser peak of 39,300 cfs on December 24. Storage in this reservoir increased about 118,000 acre-feet in the period December 20-28, while maximum return discharge to the river was held between 7,000 and 9,000 cfs until mid-January. The Tuolumne River at Modesto had a peak flow of 9,410 cfs on December 25, followed by one of 11,100 cfs on January 7. The maximum discharge of record at this location is 57,000 cfs in 1950.

Inflows to Lake McClure (Exchequer Dam) from the upper basin of the Merced River were similar to those of the Stanislaus and Tuolumne Rivers, with separate peaks of 41,400 cfs on December 23 and 36,000 cfs on December 24. The large volume of runoff of late December and early January was entirely stored in the reservoir, with a return flow to the Merced River of only 20 cfs. During December 20-January 7, reservoir storage increased by about 251,000 acre-feet. On January 7, as the result of further rainfall, inflow rose again, reaching a peak of 28,100 cfs; and discharge to the river was increased to 16,750 cfs. Downstream, the gaging station near Stevinson registered a peak flow of 10,600 cfs on January 8, compared with the peak of record of 13,600 cfs in 1950.

Flows in the San Joaquin River in the December-January storm period were moderately high, generally reflecting the operations of the reservoir-controlled major tributaries. On the upper San Joaquin, the maximum release from Millerton Lake was controlled by Friant Dam to only 69 cfs. Downstream, the gaging station near Newman, below the mouth of the Merced River, recorded a minor peak of 3,880 cfs on December 31, followed by one of 11,300 cfs on January 10. The peak flow of record at this station is 33,000 cfs in 1938. At the Vernalis gage, below the Tuolumne and Stanislaus Rivers, the river

rose to flat crests of 21,000 cfs on December 29 and 22,800 cfs on January 12. The maximum recorded flow at this location is 79,000 cfs in 1950.

An estimated runoff volume of about 1 million acre-feet entered the Sacramento-San Joaquin Delta and Suisun Bay from the San Joaquin River and tributary basins during December 21-January 11.

Northern Lahontan Area

Rainfall-runoff in the major streams of the Northern Lahontan area -- the Susan, Truckee, Carson, and Walker Rivers -- generally followed the same pattern as that of the Central Valley, with high values in the northern and central basins tapering off to moderate levels in the south. Locations of precipitation and stream gaging stations in this area are depicted on Plate 45, with selected streamflow hydrographs shown on Plate 38.

In the Susanville area, approximately 5 inches of rainfall during December 18-24 produced high runoff in the Susan River and its tributaries; Gold Run, Lassen, and Willow Creeks. The gaging station on the Susan River near Susanville had a new record peak discharge of 5,100 cfs on December 23, exceeding the former maximum flow of 3,900 cfs in 1963.

Flows in the headwater areas of the Truckee River Basin were also high; however, the operation of Boca Reservoir on the Little Truckee River and Prosser Creek Reservoir were very effective in reducing downstream discharges. These reservoirs combined to store 44,000 acre-feet of runoff during December 20-25. The Truckee River at Farad registered a flow of 12,000 cfs on December 23, compared with the maximum of 17,500 cfs recorded in 1950.

In the basins south of Lake Tahoe, runoff varied from fairly high values in the Carson River down to moderate levels in the Walker River area. The West Fork Carson River at Woodfords peaked at 3,040 cfs on December 23, compared with the high of 4,890 cfs in 1963.

FLOODED AREAS AND FLOOD DAMAGE

North Coastal Area

California's North Coast, periodically subject to severe storms and heavy rainfall, is particularly susceptible to flood damage because of unprotected development in the flood plain and the lack of flood control works in this area. In December 1955, just before Christmas, a series of such storms struck the coast; and the resultant floods, particularly along the Eel River, were the worst on record. There was considerable loss of life and very heavy property damage.

History in the North Coast counties of California repeated itself in December 1964. Continuous rainfall saturated the Coast Range and the Klamath Mountains; and as in the record floods of 1955, the rivers draining these ranges began to rise just a few days before Christmas. Those who dwelt near the flood mark paused in decorating their Christmas trees to listen with special attention to their radios for weather forecasts.

On the 21st and 22nd of December, torrential rainfall approaching cloudburst proportions was common over most of the North Coastal counties, and the major river systems were flooding and still rising. Torrents of water roared down the Smith, Klamath, Mad, Eel, Mattole, and Russian Rivers, and Redwood Creek; and record or near-record peak stages and discharges occurred. In some streams, as the Klamath, the peak stages exceeded those estimated for the legendary floods of 1861-62.

The floods of December 1964 in the North Coast area can only be described as catastrophic. Thirty-four counties in California were proclaimed by Governor Brown as disaster areas (Plate 2); and six of these counties,

Del Norte, Humboldt, Mendocino, Siskiyou, Trinity, and Sonoma in the North Coastal area suffered flood damages exceeding the combined damage in all other counties.

The most tragic of all damages was the devastation of entire communities. Klamath, Klamath Glen, Requa, Camp Klamath, Metropolitan, Holmes, Shively, Alton, and Pepperwood were virtually wiped out. Communities suffering major damages included Hoopa, Weitchpec, Orleans, Sawyers Bar, Hyampom, Orick, Gasquet, Myers Flat, Guerneville, and Healdsburg. When the water receded, townsites were debris-cluttered, and houses were piled in a helter-skelter heap.

In other areas, damage to homes, house trailers, businesses, schools, levees, sewage systems, and transportation facilities was widespread. According to Red Cross surveys, approximately 7,900 families suffered losses in this region. There were over 2,000 cases of injury or illness and 24 deaths. Approximately 2,000 homes, 400 trailer homes, and 400 small businesses were either destroyed or suffered major damage.

The widespread destruction was not limited to urban areas alone. There was severe damage to agricultural lands; federal, state, and county property; industrial areas; highways, bridges, and railroads; public utilities; and transportation companies. Damages on most of the streams far exceeded those of any known previous flood.

The damage to agricultural lands and the loss of livestock was extensive and severe. In the Eel River Delta area alone, 3,400 head of livestock, valued at \$1,190,000, were lost. In other areas, it is estimated that over 5,000 head of livestock were lost. Valuable pasture land was severely scoured or covered with several feet of mud and debris. Over 1,000

acres of pasture land in Trinity County alone will have to be reseeded to return it to productive use. Over 4,000 acres of land were irretrievably lost to stream bank erosion, and over 1,100 farm buildings were either destroyed or were heavily damaged.

The loss sustained by the principal industry of the region, the lumber industry, was extensive. Practically all the lumber mills in the flood plains were severely damaged. Cold decks were destroyed and huge stockpiles of lumber washed downstream in the Eel, Klamath, and Smith Rivers. Many companies located in the canyons lost their entire winter supply of logs. As the water rose, these logs, weighing up to 30 tons each, were picked up and carried out into the stream to become deadly missiles shooting along in the other debris. At the Pacific Lumber Company in Scotia alone, several thousand logs totaling 18,000,000 board feet, and some 23,000,000 board feet of stored lumber were swept downstream.

Most of the mills were either shut down completely or on partial operation for several months after the flood. Even after cleanup and electric power restoration, normal lumber shipments were impossible for months because of the damaged roads and railroad.

The impact of this monumental loss to the lumber industry was felt nationwide. California at present ranks second in lumber production among the fifty states, producing around 6 percent of the nation's lumber. A unique feature of the North Coast region is the fact that it produces virtually all the nation's redwood lumber.

Total losses of the regional lumber industry due to the floods were estimated at almost \$16 million. Of this, almost \$10 million was in the form of direct wetted damage and about \$4 million in net business loss.

Other nonwetted losses, such as flood fighting activity and evacuation costs, totaled almost \$2 million.

Where the damage in the lowlands and the delta areas mostly resulted from tremendous flows and heavy debris in the main streams, much of the damage in the upper canyon areas was caused by the small streams and gullies, which became raging torrents. Drainage facilities could not carry the flow, and water was soon pouring across roadways washing out fills and foundations. In places the entire fill slumped, bringing stretches of highway with it. Rock, gravel, and earth slid down hillsides to cover hundreds of feet of highway. By the night of December 22, Humboldt and Del Norte counties were completely isolated except for air and sea transport. Portions of Mendocino, Trinity, Siskiyou, and Shasta counties were also isolated. Twenty-seven bridges on various state highways, and 132 county bridges were destroyed or severely damaged.

The Northwestern Pacific Railroad suffered extensive damage to many of its facilities. In the Eel River Canyon, along the 100-mile reach from Rio Dell to Outlet Creek, more than 30 miles of track were twisted or uprooted. Three major bridges were destroyed, and over 70 pieces of rolling stock were missing. Service on the railroad from San Francisco to Humboldt County was interrupted for 177 days.

The total evaluated damages resulting from the December 1964 floods of the North Coastal streams amounted to \$193,400,000.

In the following text, flooded areas and damages in each of the principal North Coast basins are discussed separately, with a summary of total damages by basin and by type listed in Table 16. Locations of North Coast flooded areas are depicted on Plates 47-58.

Smith River Basin

The Smith River rises in Southern Oregon and flows through rugged mountain canyons until it reaches the delta area at its outlet to the Pacific Ocean, about 3-1/2 miles south of the California-Oregon border.

Approximately 9,300 acres of agricultural lands were flooded in the delta area surrounding Lake Earl, and an estimated 360 head of livestock were lost.

State and county highways and bridges suffered considerable damage. The hardest hit was Highway 199, which runs from Crescent City to Grants Pass, Oregon. Along this highway north of Gasquet to the Oregon border, 15 miles of highway were severely damaged with 1-1/2 miles completely destroyed, and three bridges were wiped out. County roads were damaged in the delta area, where inundation and scouring destroyed the roadway surface.

The principal industrial damage was the inundation of lumber mills and the loss of finished lumber and logs.

No lives were lost in the Smith River Basin, and total flood and storm damages were estimated at \$12,200,000.

Klamath River and Tributary Basins

The principal tributaries of the Klamath River are the Shasta, Scott, Salmon, and Trinity Rivers, draining a total area of nearly 16,000 square miles.

The most disastrous damage in this area was the nearly total loss of several small communities. North of Eureka, in southern Del Norte County, the Klamath River, always a strong, deep stream, rose rapidly and swept away the entire business section and many private homes in the town of Klamath.

The nearby towns of Camp Klamath, Requa, and Klamath Glen were also literally wiped out. Willow Creek, Orleans, and Happy Camp were severely damaged. Hoopa on the Trinity River and the communities of Etna, Callahan, Greenview, and Fort Jones in Scott Valley were also damaged.

Federal, state, and county highway and bridge losses were more extensive and severe than for any past flood. Fourteen state bridges were either destroyed or damaged. The beautiful old concrete arch bridge at the town of Klamath, famous for its statues of California Bears on either end, was a casualty.

The principal agricultural damages occurred at the mouth of the Klamath River and upstream in Scott Valley. There was considerable loss of livestock and also losses of crop and pasture lands.

The lumber industry, the principal industry in the Klamath Basin, was especially hard hit. Lumber mills were extensively damaged, and losses of cut lumber and logs were monumental.

Four persons lost their lives in the Klamath Basin, and total flood and storm damages were estimated at \$69,500,000.

Redwood Creek Basin

Redwood Creek drains an area of about 280 square miles of the Coast Range Mountains through narrow, deep canyons. The principal tributary is Prairie Creek, which meets the main stem a short distance upstream from the town of Orick.

Orick, the only major community in the basin, which is located in a small valley near the mouth of Redwood Creek, was completely inundated under

five feet of water. The agricultural lands in the valley were deeply silted and covered with logs and debris. Of the 1,500 acres in the flood plains, 1,400 acres were flooded.

No lives were lost in the Redwood Creek Basin, and total flood and storm damages were estimated at \$1,300,000.

Mad River Basin

The Mad River rises in the Coastal Mountain Range and flows through mountain canyons and small valleys until it emerges into the delta area in the vicinity of Blue Lake, 10 miles from the Pacific Ocean. The river enters the Pacific Ocean about 14 miles north of Eureka.

The delta area and the agricultural areas in the Mad River Valley were flooded severely, resulting in damage to 6,400 acres by erosion, siltation, and debris deposits, and a high loss of dairy cattle.

Several lumber mills in the flood plain suffered considerable damage, and stockpiled logs were swept downstream and deposited in the delta.

Highway 299 was damaged by slides and washouts, and the Mad River's North Fork bridge lost the approach on the left bank.

No lives were lost in the Mad River Basin, and total flood and storm damages were estimated at \$7,800,000.

Eel River Basin

The Eel River drains an area of approximately 3,600 square miles and includes portions of Humboldt, Mendocino, Trinity, Glenn, and Lake counties. The principal tributaries are the Van Duzen, North Fork Eel, Middle Fork Eel,

and South Fork Eel Rivers. The streams flow through narrow, steep-walled canyons except for that portion near the mouth of the Eel River where it flows over the wide, flat-floored delta area.

The flood damage in the Eel Basin from the December 1964 flood was almost unbelievable. The communities of Pepperwood and Myers Flat were completely destroyed; and in Weott, Shively, Stafford, Scotia, Alton, and Phillipsville, only a few buildings were left standing.

Agricultural lands in the Eel Delta were left as a sea of mud. Pasture lands were eroded and scoured, and debris was scattered over the entire delta. Farm buildings and homes were destroyed and livestock losses were high. The dairy industry suffered extensively from livestock losses and building and equipment damages.

The damage inflicted to the lumber industry was disastrous, as millions of board feet of lumber and prime redwood logs were swept downstream.

Nineteen persons lost their lives in the Eel River Basin, and total flood and storm damages were estimated at \$81,600,000.

Coastal Stream Basins

These are streams that are outside the major watersheds and which drain directly into the Pacific Ocean. The principal streams are the Bear and Mattole Rivers, Usal, De Haven, and Wages Creeks, Ten Mile, Noyo, Big, and Navarro Rivers, Alder Creek, and Garcia and Gualala Rivers. Their watersheds range along the westerly slopes of the Coastal Range Mountains south from the Eel River mouth to the Russian River.

The flood damage for these basins consisted of damage to agricultural land, lumber mills, roads, and bridges.

No lives were reported lost in any of these basins, and total flood and storm damages were estimated at \$3,800,000.

Russian River Basin

The Russian River is about 110 miles long, and flows through a drainage basin of about 1,400 square miles. The principal tributaries to the Russian River are the East Fork Russian River, and Feliz, Big Sulphur, Maacama, Dry, Mark West, and Austin Creeks.

The damages in this basin exceeded those resulting from the December 1955 flood. In the community of Guerneville and the surrounding resort area, 500 persons were left homeless and 1,000 summer homes were either destroyed or damaged.

The principal agricultural losses were orchard, crop, and vineyard damages, some damage to farm buildings, and some livestock losses.

The resort areas along the canyon upstream from the mouth were hit particularly hard with considerable damage to private property.

Many county roads and bridges were destroyed or damaged. Highway 101 at Hopland was under 5 feet of water at one time, and Highway 16 from Hopland to Lakeport was closed because of slides.

According to the coroner's report, one life was lost in the Russian River Basin, and total flood and storm damages were estimated at \$17,200,000.

Table 16

Summary of Flood and Storm Damage
North Coastal Area

Item	Damages in \$1,000							Totals
	Smith River	Klamath River and Tributaries	Redwood Creek	Mad River	Eel River	Coastal Streams	Russian River	
Residential	600	4,600	100	100	4,800		5,800	16,000
Commercial	200	4,600	400	300	3,300	200	3,100	12,100
Public Facilities	1,200	6,900		800	2,000	100	200	11,200
Public Utilities	200	3,600			1,600	200	100	5,700
Agriculture	1,900	3,200	300	1,300	12,200	900	3,700	23,500
Bank Erosion		700			300	100	400	1,500
Roads and Bridges	5,600	36,800	100	2,400	17,700	1,200	1,400	65,200
Industrial		2,200	200	900	12,800	500		16,600
Livestock	100				1,400			1,500
PL/99		100		500	800		400	1,800
PL/875	2,000	6,200	100	1,400	6,000	300	1,400	17,400
Emergency Aid	400	600			1,700		500	3,200
Railroad					17,000	100	200	17,300
Miscellaneous			100	100		200		400
Total Flood and Storm	12,200	69,500	1,300	7,800	81,600	3,800	17,200	193,400



Photograph courtesy of
Eureka Newspapers, Inc.



Torrents of water roared through the canyons
and valleys of California's North Coast leaving in its
wake destroyed townsites,



homes piled helter-skelter,



families homeless and without transportation,



Photograph courtesy of
Eureka Newspapers, Inc.



railroad tracks uprooted and
rolling stock left scattered,



and bridges washed downstream.



The overwhelming job of restoration.



Central Valley Area

The major drainage area of the Central Valley consists of the combined watersheds of the Sacramento and San Joaquin River systems, which form a mountain-enclosed basin about 500 miles long, with an average width of 120 miles, comprising more than one-third the total area of the State. The Sacramento River drains an area of more than 26,000 square miles and the San Joaquin River an area of about 20,000 square miles.

At their junction, the Sacramento and San Joaquin Rivers have formed a low-lying delta. This area comprises about 500,000 acres of highly developed agricultural lands divided by natural channels and dredge cuts into about 100 tracts or islands.

The December 1964-January 1965 storms produced high flows on most mountain and foothill streams, and new record flows were recorded at many locations in the Sacramento River Basin.

In spite of these high flows, flood peaks on the Sacramento River and major tributaries were confined within project levees or in the bypasses; and flooded areas on the valley floor comprised lands between project levees, lands not protected by levees, and lands in the bypasses.

Significant amounts of flooding on the valley floor occurred from minor tributary streams. The total area inundated in valley floor areas in the Sacramento River Basin was estimated at 222,500 acres. Practically all the area flooded was agricultural land. Many cities and towns along the Sacramento River and tributaries were threatened by high water, but only nominal flooding occurred.

Severe flooding occurred in the mountain communities of Chester, Downieville, and Coloma. Mountain highways, roads, bridges, public recreation

areas, and cabins were extensively damaged. Portions of several mountain valleys devoted primarily to the production of meadow hay were also flooded. The total area inundated in the mountain area of the Sacramento River Basin was estimated at 161,000 acres.

In the San Joaquin River Basin, flooding extended as far south as the Fresno River Basin. Extensive flooding occurred from the Cosumnes and Stanislaus Rivers; however, flooding was only nominal on the lower Chowchilla and Fresno Rivers and was generally minor on the other streams in the basin. The total area inundated in the valley floor area of the San Joaquin River Basin was estimated at 70,200 acres, and 1,700 acres were flooded in the mountain areas.

The total evaluated damages in the Central Valley area resulting from the December 1964-January 1965 floods amounted to \$43,737,000.

The following text discusses flooded areas and damages in the principal rivers and tributaries of the Central Valley, and summaries of total damages by stream and by type are listed in Tables 17 and 18. Locations of Central Valley flooded areas are depicted on Plates 59-61.

Sacramento River

In the area above Shasta Dam, flooding which occurred along the Sacramento River and its upper tributaries, the Pit and McCloud Rivers, resulted in damages amounting to more than \$4,000,000.

Over 47,000 acres of agricultural lands primarily used for pasture, alfalfa, and meadow haylands were inundated along the upper Pit River from Goose Lake to Big Valley. Damages consisted mainly of crop losses, bank erosion, and deposition of debris.

Flood damages on the McCloud River and lower Pit River were generally limited to powerhouse facilities of the Pacific Gas and Electric Company.

On the upper Sacramento River, damage to residences, roads, bridges, railroads, and U. S. Forest Service facilities occurred in the vicinity of Dunsmuir and at several other locations in this area.

Although Shasta Lake had near record inflows, damages along the Sacramento River below Shasta Dam were kept to a minimum by controlled releases of 6,000 cfs downstream at Keswick Dam during the intense flood period on December 22, 1964. Flows were subsequently increased to a maximum of 50,000 cfs on December 27 as flood control releases were made.

Minor to moderate flooding of agricultural lands occurred along the Sacramento River banks in the reach between Shasta Dam and Red Bluff, and minor residential flooding occurred in the slough areas east of Red Bluff.

Approximately 39,000 acres of agricultural land were flooded between Red Bluff and Chico Landing. Marinas, fishing resorts, and trailer parks within this reach of the river were extensively damaged.

From Chico Landing to Colusa, about 3,000 acres of prune orchards and walnut groves, and 2,000 acres of land planted in row crops, grains, and pasture were flooded. Commercial property such as marinas, restaurants, and boat landings received minor damage, but no residential damage occurred.

Below Colusa, the Sacramento River was confined within project levees, causing no agricultural losses; but extensive residential damage occurred to homes constructed within project levees on the flood plain. Heavy damage to marinas, boats, boat landings, and docks occurred; and there was also

considerable erosion of levees. Total flood damage along the Sacramento River and its upper tributaries above Shasta Dam amounted to \$7,716,000.

Redding Stream Group

Flooding on streams in this group was largely confined to Cottonwood, Battle, Churn, and Olney Creeks and Oregon Gulch, with minor flooding on Clear, Anderson, Cow, and Paynes Creeks. Agricultural damages consisted generally of losses of crops, livestock, fruit and nut trees, and of land through erosion. Commercial damages were suffered by stores and motels in the area. Public facility damages consisted of the loss of several bridges and erosion of levees and roads. Total flood damages in this area were estimated at \$1,581,000.

Middle Sacramento River West Side Tributaries

The streams in this group that overflowed and caused considerable damage were Elder and Thomes Creeks, and other minor tributaries. Along Elder Creek and other miscellaneous creeks in the area, damages were primarily agricultural, consisting of crop losses and land erosion. Extremely heavy damages occurred along Thomes Creek, including agricultural, residential, commercial, industrial, and public utilities, when portions of the towns of Paskenta and Richfield were flooded. In the reach from Paskenta to Henleyville, about 2,500 acres were flooded; and from Henleyville to the Sacramento River, about 5,800 acres were flooded. Total flood damages on these streams amounted to \$2,629,000.

Middle Sacramento River East Side Tributaries

The streams in this group that overflowed and caused damage were Big Chico, Mill, Deer, and Antelope Creeks. A total of about 1,800 acres of

land were flooded, including agricultural land used for orchards, row crops, and pasture. Along Mill Creek, several trailer courts and fishing resorts were damaged; and extensive erosion of U. S. Highway 99E occurred at the North Fork bridge. Total flood damages on this stream group reached \$907,000.

Stony Creek

Flooding was heavy along Stony Creek from the foothill areas to Stony Gorge Reservoir, particularly in the vicinity of the town of Stonyford. Moderate flooding occurred in the reach between Stony Gorge and Black Butte Dams, and minor overflows took place east of Orland, near the Central Irrigation Canal. About 3,100 acres of agricultural land were flooded, mostly pasture and cultivated cropland, with some orchards. Damages consisted mainly of deposits of sand, silt, and debris; erosion; and loss of crop production. No residential or commercial damages were reported. Total flood damages on Stony Creek amounted to \$642,000.

Butte Basin and Tributary Streams

Over 100,000 acres of land within Butte Basin were flooded as a result of overflow from the Sacramento River at Moulton and Colusa Weirs on the west, and inflow from Butte Creek and Cherokee Canal on the east. Since the agriculture of this area is devoted mainly to the production of barley and rice, crop losses were minimal due to the time of year that flooding occurred. Other damages, which consisted of those to orchards, roads, and levees, included silting, land erosion, and debris deposits. No residential

or industrial damages occurred. Total flood damage in this area was \$1,061,000.

Colusa Basin and Tributary Streams

The streams that overflowed in this group were the Colusa Drainage Canal and the Willow Creek stream system. Very little overflow occurred from Willow Creek or its tributaries, as the channels had been cleared and straightened before the flood and the system was able to carry the heavy flow with only minor flooding. General flooding occurred west of the Colusa Drainage Canal and about 8,600 acres of agricultural land were inundated, with damages consisting mainly of the filling of irrigation ditches with sand, silt, and debris. No residential or commercial damages were reported. Total flood damages amounted to \$208,000.

Feather River

Near Lake Almanor, flooding along the North Fork Feather River inundated a large portion of the town of Chester and washed out a bridge on State Highway 36. Several smaller streams also overflowed near Chester, bringing the total flooded area to about 220 acres. Fifty commercial buildings and 260 residences were damaged by the high water.

A private levee failed on Indian Creek, causing inundation of about 420 acres of pasture land in Indian Valley. Spanish Creek and several small tributaries overflowed in the Quincy area, flooding about 140 acres, including residences and tourist facilities. Flooding in other areas above Oroville was confined to minor streams such as Gray Eagle, Lights, Red Clover, and Thompson

Creeks, which flooded about 120 acres of agricultural land. Near the Oroville Dam site, high flows caused damages to the contractor's haul railroad and construction facilities at Thermalito Diversion Dam, and flooding of various borrow areas.

In the reach of the Feather River from Oroville to Verona, flooding to a maximum width of about 2-1/2 miles occurred along one or both banks in the area upstream from Marysville. However, this flooding was contained within the project levees below Hamilton Bend on the right bank and below Honcut Creek on the left bank, and by high ground upstream from these levees. Over 19,000 acres of agricultural land located within the flood plain was damaged, and there was considerable levee erosion. Significant agricultural flooding also took place north of Marysville from Jack and Simmerly Sloughs, where about 6,500 acres of land were inundated.

The major damages in the Feather River Basin were mainly agricultural and those to public facilities. Agricultural damages included losses of crops, orchards, pasture land, and livestock; erosion, silting, and debris; and damages to farm buildings and equipment. Public facility damages included those to levees, roads, and bridges; to U. S. Forest Service facilities in mountain areas; and the cost of flood fighting, channel clearing, and cleanup. Total flood damages amounted to \$8,070,000.

Yuba River

In the mountain areas of the Yuba River Basin above Englebright Dam, there was considerable flood damage to summer cabins, U. S. Forest Service campgrounds, and highways. Water entered the basements of most residences and commercial buildings in the town of Downieville when high North Yuba River

flows caused the Downie River to back up and overflow. On the South Yuba River, high water damaged the Washington Diversion Dam near the town of Washington, and a portion of U. S. Interstate Highway 80, including many secondary roads, in the Lake Spaulding - Soda Springs area.

Below Englebright Dam, about 4,700 acres of farmland between the project levees east of Marysville were damaged; and a golf course, radio station, and several small businesses were flooded. The Daguerre Point debris-control dam, 10 miles upstream from Marysville, received damage to the right abutment.

Types of flood damages included those to various structures, bank and levee erosion, debris deposits, and crop losses. Total damage amounted to \$5,677,000.

Bear River

Only minor flooding was reported along the Bear River downstream from Camp Far West Dam when several small tributaries, Yankee Slough, Reeds Creek, and Hutchinson Creek, overflowed and inundated about 1,800 acres of pasture land and a few small orchards in the vicinity of U. S. Highway 99E. No residential, commercial, or industrial damage occurred; and the total flood damages amounted to \$177,000.

Coon Creek Stream Group

The streams that flooded in this group were Coon Creek, Bunkham Slough, Markham Ravine, Auburn Ravine, and Pleasant Grove Creek. Coon Creek,

Markham Ravine, and Bunkham Slough overflowed their banks and flooded about 3,900 acres 10 miles west of the town of Lincoln. Auburn Ravine overflowed its banks for a distance of about 12 miles, flooding about 2,400 acres in the same area. Flooding on Pleasant Grove Creek extended from about 4 miles east of the Sutter-Placer County line to the Western Pacific Railroad track near Pleasant Grove and covered about 1,400 acres. Damages on these streams were minor and consisted mainly of levee and bank erosion and deposits of sand and debris. Crop losses were small; and no commercial, residential, or industrial damages occurred. Total damages amounted to \$47,000.

Clear Lake-Cache Creek

Along the streams tributary to Clear Lake about 3,000 acres of land, almost entirely agricultural, were flooded as the result of overflows from Scotts, Kelsey, Adobe, Middle, and Clover Creeks. The heaviest losses occurred along Scotts Creek, where pear and nut orchards were severely damaged. No residential or commercial damage was reported in this area, but considerable damage occurred to county roads and bridges, with widespread erosion of land and levees.

Flooding occurred along Cache Creek from below Rumsey, at the head of Capay Valley, downstream to the vicinity of the town of Yolo, a distance of about 35 miles. About 10,000 acres of agricultural land were inundated, with losses of pasture, crops, and livestock; deposits of silt and debris; and damages to roads, bridges, and levees. Total flood damages in the Clear Lake-Cache Creek area amounted to \$1,447,000.

American River

On the American River and its tributaries above Folsom Reservoir, extensive damage occurred to various units of the Placer County Water Agency's Middle Fork American River Project, including the breaching of the partially completed Hell-Hole Dam under construction on the Rubicon River. Because of impending law suits, cost of damages to this project are not available, but estimates of \$5,000,000-\$10,000,000 have been made. These losses are not included in the total damages noted below. Other damages in this area included the flooding of summer homes, the loss of a bridge on State Highway 49 near Auburn, and the deposition of a large amount of logs and debris in Folsom Reservoir.

Below Folsom Dam, flooding was confined to areas between project levees, and damages consisted mainly of levee and bank erosion in the Carmichael-Sacramento area. Total flood damages were \$4,445,000, of which about 85 percent were losses to public facilities.

Putah Creek

Overflows along Putah Creek were confined to the areas above Monticello Dam and Lake Berryessa, and only moderate flooding of about 1,900 acres was reported. The principal flooded areas were Coyote and Collayomi Valleys and in the vicinity of Middletown, with damages consisting of silting and debris deposits, erosion of pastureland, and minor damage to private residences. Total flood damages were \$149,000.

Cache Slough and Tributary Streams

Only minor flooding of about 7,100 acres of land occurred along Cache Slough and its small tributary creeks. Agricultural damages were small, and public facility damage was limited to the loss of a small bridge over Ulatis Creek. No residential, commercial, or industrial damage was reported; and the total flood damages amounted to \$194,000.

Project Bypasses and Deep Water Ship Channel

Sutter and Yolo Bypasses, as part of the Sacramento River Flood Control Project, were very effective in bypassing high flows and large volumes of water around highly developed urban, suburban, and agricultural areas. Within the bypasses, all the lands are either owned by the State of California or are covered by flowage easements; and a large part is intensively cultivated, except during the winter flood season.

The total flooded area in the bypasses amounted to 92,400 acres, including the so-called "tidal tracts" (Liberty, Prospect, and Little Holland Islands, and Egbert Tract) which are located near the lower end of the Yolo Bypass and are protected against only minor flows by low levees. The major damages were mainly agricultural and those to public facilities and included erosion of land and levees, silting and debris deposits, loss of livestock, and the cost of repairs to farm facilities (roads, fences, etc.). Large quantities of sand and silt were deposited in the Sacramento River Deep Water Ship Channel, requiring extensive dredging. No residential or commercial damages were reported, and the total flood damages amounted to \$3,399,000.

Sacramento-San Joaquin Delta

In the Sacramento-San Joaquin Delta area, a combination of high tides and heavy inflow resulted in unusually high water levels in the many sloughs and channels. This, together with strong winds which generated high waves, created a very perilous condition for the levees protecting Twitchell, Venice, Bethel, Bradford, Brannan, Andrus, Webb, and Jersey Islands. When these levees were threatened by erosion and overtopping, a major flood fighting program was mobilized, and a massive effort succeeded in preventing flooding of these islands. In the flood fight were local agency and Department of Water Resources forces and approximately 1200 inmates from conservation camps of the Department of Corrections. The inmate crews were in the immediate charge of about 250 crew chief personnel of the Division of Forestry, who were in turn advised by Department of Water Resources engineers. These forces represented about 20 conservation camps throughout the State. The only flooding which occurred in this area was about 400 acres of agricultural land east of Bishop Tract, which were inundated when a short section of levee failed.

The total flood damages in the Sacramento-San Joaquin Delta amounted to \$875,000, almost all of which consisted of costs of flood fighting and of repairing damaged levees and levee roads.

Table 17

Summary of Flooded Areas and Damage
Central Valley Area-Sacramento River Basin

Stream	Acres Flooded	Primary Flood Damage in \$1,000					Total
		Agri- cultural	Resi- dential	Commercial	Industry & Utilities	Public Facilities	
Sacramento River above Shasta Dam	47,260	366	204	51	2,093	1,397	4,111
Sacramento River below Shasta Dam	43,600	1,323	140	473	49	1,620	3,605
Redding Stream Group	5,875	399	71	11	32	1,068	1,581
Middle Sacramento River Tributaries-West Side	9,765	859	38	18	455	1,259	2,629
Middle Sacramento River Tributaries-East Side	1,830	89	0	42	22	754	907
Stony Creek	3,130	94	0	0	6	542	642
Butte Basin and Tributary Streams	100,400	827	0	6	61	167	1,061
Colusa Basin and Tributary Streams	8,635	82	0	0	2	124	208
Feather River	27,100	2,613	82	99	399	4,877	8,070
Yuba River	4,720	254	31	51	104	5,237	5,677
Bear River	1,750	16	0	0	149	12	177

Table 17 (Continued)

Summary of Flooded Areas and Damage
Central Valley Area-Sacramento River Basin

Stream	Acres Flooded	Primary Flood Damage in \$1,000					Total
		Agri- cultural	Resi- dential	Commercial	Industry & Utilities	Public Facilities	
Coon Creek Stream Group	7,700	37	0	0	0	10	47
Clear Lake-Cache Creek	16,195	520	2	0	122	803	1,447
American River	3,780	13	242	5	420	3,765	4,445
Putah Creek	1,890	67	9	0	11	62	149
Cache Slough and Tributary Streams	7,110	13	0	0	0	181	194
Project Bypasses and Deep Water Ship Channel	92,400	1,253	0	0	17	2,129	3,399
Sacramento-San Joaquin Delta	<u>400</u>	<u>10</u>	<u>0</u>	<u>0</u>	<u>17</u>	<u>848</u>	<u>875</u>
TOTAL, Sacramento River Basin	383,540	8,835	819	756	3,959	24,855	39,224

Morrison Creek

Flooding of about 7,700 acres of agricultural land in Sacramento County occurred along Morrison Creek and one of its principal tributaries, Laguna Creek. The flooded area extended from near the town of Elk Grove west and south to the vicinity of Snodgrass Slough, for a total distance of about 11 miles.

The damages were mainly those to farm facilities, including pasture land and roads, crop losses, and cost of debris removal and cleanup. No residential, commercial, or industrial damages were reported; and total flood damage amounted to \$156,000.

Cosumnes River and Tributary Streams

Overflows along the Cosumnes River and Deer Creek began about 3 miles above Sloughhouse and extended downstream about 30 miles. About 23,500 acres of agricultural land were inundated, including the McCormack-Williamson Tract near the confluence of the Cosumnes and Mokelumne Rivers, which was flooded from a break in a cross levee. Flooding of 8,200 acres also occurred along a 31-mile reach of Dry Creek, from the vicinity of Ione downstream to the Cosumnes River. In addition, minor flooding took place along several small tributaries; Badger, Laguna, and Willow Creeks.

Damages consisted mainly of those to crop and pasture lands; the cost of repairs to farm equipment, facilities, and roads; and considerable levee erosion. No residential or commercial damages were reported, and the total flood damage reached \$824,000.

Mokelumne River

No significant overflow or flooding took place along the Mokelumne River; however, some damages did occur when heavy flows deposited rocks in the river channel below the spillway of Pardee Dam. Total damage amounted to \$242,000, which was the cost of removal of the rocks and other debris.

Stockton Area Streams

Only minor overflows occurred along the streams in the Stockton area, which include the Calaveras River, Mormon Slough, and Bear, Littlejohn, and Duck Creeks. Flooding was limited to about 200 acres; and damages consisted of bank and levee erosion, loss of pasture and crops, and deposits of silt and debris. Damages in this area totaled \$79,000.

Stanislaus River

Only minor flooding occurred along the Stanislaus River above Melones Dam, with damages to public facilities in Calaveras Big Trees State Park and Stanislaus National Forest. Below Melones Dam, significant overflows extended from the foothill area, near the town of Knights Ferry, to the vicinity of the San Joaquin River. About 11,400 acres of intensively cultivated and highly productive agricultural land was inundated, including orchards, vineyards, and various truck and specialty croplands.

Agricultural damages consisted of the loss of crops, livestock, and poultry, and damage to farm equipment and facilities. Other damages were those to sewage disposal plants, roads, parks, and levees, and minor residential damage was reported at the towns of Ripon, Riverbank, and Oakdale. Total flood damage amounted to \$1,708,000.

Tuolumne River

Above Don Pedro Dam, flooding along the Tuolumne River and its upper tributaries was limited to the Stanislaus National Forest, with damages to public facilities estimated at \$84,000. Other flooded areas occurred east of Modesto and downstream near the mouth of the Tuolumne River, totaling about 400 acres of cultivated land.

Agricultural damages consisted mainly of crop losses and erosion of land and private levees. No residential, commercial, or industrial damages were reported, and the total flood damage amounted to \$127,000.

Merced River

Heavy runoff from the headwaters of the Merced River caused considerable flooding and damage in Yosemite Valley, where the river overflowed its banks and inundated about 1,100 acres of the valley floor. Downstream, minor flooding occurred near the towns of Snelling and Livingston, and flooding of about 800 acres of agricultural land took place from 6 miles west of Livingston to the vicinity of the San Joaquin River.

In Yosemite Valley, damages consisted of flooding of campsites and recreational facilities, bank erosion, and damages to roads and bridges. Heavy damages amounting to more than \$500,000 occurred at the construction site of New Exchequer Dam, where a river crossing, cofferdam, construction shops, and portion of the dam embankment were either damaged or destroyed. Other damages, mainly agricultural, were crop losses and levee and bank erosion. No residential or commercial damages were reported, and total flood damage amounted to \$988,000.

Merced County Stream Group

The streams in this group that flooded and caused damages were Bear, Mariposa, and Deadman Creeks, all of which overflowed in the area west of Merced near the San Joaquin River. About 14,100 acres of agricultural land were inundated, including 10,000 acres along Bear Creek, 3,500 acres on Mariposa Creek, and 600 acres along Deadman Creek.

Damages consisted of loss of crops and native pasture; the cost of repairs to farm roads, fences, and other improvements; and the cost of flood fighting, levee repair, and cleanup. No residential, commercial, or industrial damages were reported; and the total flood damage amounted to \$115,000.

San Joaquin River

Because of moderate flows in the San Joaquin River, no levees were overtopped or breached, and the only flooding occurred on the flood plain and benches between levees.

Damages along the lower San Joaquin River were generally limited to levee erosion; minor agricultural damage consisted of the loss of crops and pasture in the flood plain area. No residential or commercial damages were reported, and the total flood damage amounted to \$274,000.

Table 18

Summary of Flooded Areas and Damage
Central Valley Area-San Joaquin River Basin

Stream	Acres Flooded	Primary Flood Damage in \$1,000					Total
		Agri- cultural	Resi- dential	Commercial	Industry & Utilities	Public Facilities	
Morrison Creek	7,700	134	0	0	0	22	156
Cosumnes River and Tributary Streams	35,200	533	0	0	21	270	824
Mokelumne River	--	0	0	0	7	235	242
Stockton Area Streams	200	11	0	0	17	51	79
Stanislaus River	11,400	977	7	2	9	713	1,708
Tuolumne River	400	17	0	0	0	110	127
Merced River	1,900	61	0	0	520	407	988
Merced County Stream Group	14,100	105	0	0	0	10	115
San Joaquin River	<u>1,000</u>	<u>11</u>	<u>0</u>	<u>0</u>	<u>56</u>	<u>207</u>	<u>274</u>
TOTAL, San Joaquin River Basin	71,900	1,849	7	2	630	2,025	4,513



Folsom Dam & Reservoir, and the river levee system
confined the American River within its flood plain.



Severe erosion of the American River
channel endangered homes within the flood plain.



Oroville embankment impounded the record peak flow of the Feather River and substantially reduced that peak to safe downstream flows.



Flood fighting in the Sacramento-San Joaquin Delta
to save levees threatened by erosion and overtopping.

Northern Lahontan Area

The Northern Lahontan area consists of the following group of closed drainage basins: Alkali Lakes, Eagle Lake, Honey Lake, Truckee River, Carson River, Walker River, Mono Lake, and Owens River Basins. These basins drain contiguous areas with headwaters on the eastern slopes of the Sierra Nevada Mountains. They have no outlets to the sea, and their drainages terminate in lakes or "sinks", which are remnants of ancient Lake Lahontan. The major economy of these basins is generally based on cattle raising and associated agriculture, with important tourist and recreational activities in the Lake Tahoe area.

Only relatively minor flooding and related damages occurred in the Northern Lahontan area, principally in the Alkali Lakes, Honey Lake, and Truckee and Walker River Basins. Flooded areas totaled about 18,000 acres, with damages amounting to \$601,000. The following text discusses flooded areas and damages in each of the basins affected, with summaries of total damages by basin and by type listed in Table 19.

Alkali Lakes Basin

Flood flows from 43 small streams discharged rapidly into Surprise Valley and Upper, Middle, and Lower Alkali Lakes, inundating about 2,000 acres of hay and pasture land. The largest of these streams are Bidwell, Mill, Soldier, Pine, Cedar, Deep, Cottonwood, Owl, Rader, Eagle, and Emerson Creeks.

Damages consisted of channel erosion; deposits of sand and debris; and damage to irrigation facilities, fences, roads, and bridges. Total flood damages in this basin amounted to \$191,000.

Honey Lake Basin

In the Honey Lake Basin, flooding from the Susan River and its tributaries, Gold Run, Lassen, and Willow Creeks, occurred in the area between Susanville and Honey Lake, for a distance of about 16 miles. A total of 14,300 acres of agricultural land were inundated.

Agricultural damages, which were about 95 percent of the total damage, consisted of land erosion, crop losses, and damages to farm equipment and facilities and roads. Total flood damage in this basin amounted to \$113,000.

Truckee River Basin

Flooded areas and damages in the portion of the Truckee River Basin which lies within California were generally limited to the small streams tributary to Lake Tahoe, including the Upper Truckee River and Blackwood Creek, and to Prosser Creek and the Little Truckee River. Along the Lake Tahoe tributaries, about 1,200 acres were inundated, including grazing land, potential subdivision land, summer residential areas, streets, and roads. Flooding along Prosser Creek and the Little Truckee River was minor, with damages to roads being the most significant. On the main stem Truckee River, only minor flooding took place between Lake Tahoe and the Nevada State line, although considerable damage occurred downstream from the Reno-Sparks area to Pyramid Lake.

The principal damages in this basin consisted of land and channel erosion, and deposits of sand and debris. Total damages amounted to \$264,000, exclusive of those in the State of Nevada.

Walker River Basin

Only minor damage occurred in this basin when about 500 acres of agricultural land were flooded along the West Walker River between the town of Coleville and Topaz Lake. Damages consisted mainly of bank erosion, crop losses, and the cost of repairs to farm equipment and facilities. Total damages amounted to \$33,000.

Table 19

Summary of Flooded Areas and Damage
Northern Lahontan Area

Stream	Acres Flooded	Primary Flood Damage in \$1,000					Total
		Agri- cultural	Resi- dential	Commercial	Industry & Utilities	Public Facilities	
Alkali Lakes Basin	2,000	108	1	1	0	81	191
Honey Lake Basin	14,300	108	3	2	0	0	113
Truckee River Basin*	1,200	0	45	5	17	197	264
Walker River Basin	<u>500</u>	<u>33</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>33</u>
TOTAL, Northern Lahontan Area	18,000	249	49	8	17	278	601

*Does not include flooded areas or damage in the State of Nevada.

PROGRESS REPORT
ON THE
CALIFORNIA FLOOD CONTROL PROGRAM

During the devastating floods of December 1964, the Governor directed the preparation of a strengthened and accelerated flood control program for the State of California. The objectives of the program were to increase the State's capability of preventing and combating floods, to coordinate and strengthen the flood control activities of participating agencies, at the local, state, and federal levels, and to provide a framework within which all agencies could work to provide the much needed additional flood protection. The desired program was formulated by a special committee of Department of Water Resources personnel and was published in February 1965 as Bulletin No. 159-65, "The California Flood Control Program: 1965". The program presented in the bulletin is a step in carrying out the legislative directive of Section 12580 of the California Water Code, which, among other things, declares that the State should engage in the study and coordination of flood control projects undertaken by all levels of government.

The recommendations for action under the program were summarized in Chapter VIII of the bulletin. The purpose of this progress report is to highlight steps taken toward implementing the recommendations and to identify problems which have delayed desired progress.

Flood Control Projects and Investigations

The flood problems of many areas of the State have been investigated and works for solution of the problems have been

proposed. In other areas, reconnaissance level studies have identified potential projects which might solve an area's flood problems. In additional areas, there is a need for comprehensive basin-wide studies. The detailed investigation of potential projects and problem areas and the authorization and construction of projects which have been found to be justified are vital elements in a program to provide the flood protection needed by the people of the State. The following sections describe the current status of this phase of the California Flood Control Program.

Projects Recommended for Authorization and Construction

A number of projects were recommended for authorization and construction in Bulletin No. 159-65. This section identifies these important projects and presents their current status.

Marysville Reservoir. This project on the Yuba River, acting in conjunction with the Department's Oroville Reservoir on the Feather River, is urgently needed to provide a high degree of protection to the vulnerable Yuba City-Marysville area. The State has commented favorably on the proposed project of the U. S. Army Corps of Engineers, and the federal report recommending authorization is awaiting transmission to the Congress by the Secretary of the Army. Early authorization and construction of this project is of great importance.

Auburn Reservoir. This project was authorized in September 1965, for construction by the U. S. Bureau of Reclamation. Located upstream from the existing Folsom Reservoir, it will increase Sacramento's protection from floods on the American River. The need for this increased protection was dramatically demonstrated during the

December 1964 flood when three-fourths of the flood control reservation at Folsom was filled and maximum releases were being made. Six more hours of 200,000 cfs inflow would have filled the reservoir and caused uncontrolled spill. The carrying capacity of the channel of the American River would probably have been exceeded and highly developed residential areas would have been flooded due to levee failures. Even with the controlled release, the levee protecting Sacramento was severely eroded and continuous placement of rock for protection was necessary to save it.

The Congress appropriated funds for rights-of-way engineering, and possibly some land acquisition, in the 1965-66 fiscal year. The President's Budget for fiscal year 1966-67 contains an item of \$2,500,000 to begin design of the dam. Construction is scheduled to start early in 1968, if funds are appropriated. The construction schedule for this vital project should be maintained and, if possible, accelerated.

Knights Valley Reservoir. This project would provide additional flood control in the Russian River Basin. The Corps of Engineers has recommended authorization of the project with staged construction. This would provide flood control benefits now and water conservation when needed. The Bureau of Reclamation is also studying the project with a view toward one-stage construction. The Department has recommended construction of a project at this site and is urging the two agencies to agree on a project which will be most beneficial and to submit such a project for authorization at the earliest possible time.

Sacramento River Bank Protection Project. This authorized Corps of Engineers project is about 25 percent complete and was recommended for accelerated construction. The proposed 1966-67 Federal Budget continues appropriations for the project but does not increase the rate of construction.

Nashville Reservoir. This reservoir would be part of the Cosumnes River Project. The State has commented favorably on the project proposed in the Bureau of Reclamation's preliminary report. The final report is being prepared for transmittal to Washington.

Lakeport Reservoir. This project on Scotts Creek, Lake County, was authorized for construction by the Corps of Engineers by the Flood Control Act of 1965. The President's Budget for 1966-67 does not, however, recommend funds for design of the project.

Wilson Valley Reservoir. The Department has recommended that this project on Cache Creek be constructed as a conjunctive feature of the Bureau of Reclamation's proposed West Sacramento Canal Unit of the Central Valley Project. The Bureau is considering this proposal.

Eel River Delta Levee Project. This Corps of Engineers project was authorized by the Flood Control Act of 1965. It will provide protection to an area which experienced some of the worst devastation in the 1964 floods. The proposed 1966-67 Federal Budget contains funds for design of the project.

Sonoma Creek. This Corps of Engineers project in Sonoma County was authorized by the Flood Control Act of 1965. There are no funds for design in the President's 1966-67 Budget.

Napa River Project. This Corps of Engineers project was authorized by the Flood Control Act of 1965. It will provide needed flood protection for the City of Napa. Funds for design are included in the proposed 1966-67 Federal Budget.

Lytle and Warm Creeks Project. This Corps of Engineers project was authorized by the Flood Control Act of 1965. The project will provide protection along the creeks in the cities of San Bernardino and Colton. Funds for design are included in the proposed 1966-67 Federal Budget.

Beardsley Watershed Project. This Soil Conservation Service project is awaiting federal authorization. The benefits expected to accrue to the town of Nyland and the City of Oxnard depend on construction of both this project and the Revolon Watershed Project.

Revolon Watershed Project. This Soil Conservation Service project received federal authorization in October 1965. As noted above, Revolon and Beardsley are interrelated projects and construction of both projects will be necessary to qualify them for state financial assistance. Authorization and construction of both projects is needed to improve flood control protection in Ventura County.

San Gabriel River Watershed Project. This proposed Soil Conservation Service project is still awaiting federal authorization. The project would provide for the construction of numerous check dams and three debris basins and channels to control sediment and flood-water runoff in the San Gabriel Mountains.

Kings River Channel Improvement. Completion of this authorized San Joaquin Valley project has been delayed for several years because the local interests did not provide the necessary rights-of-way.

The rights-of-way are now available and the project is ready to proceed. There are, however, no funds for the project in the proposed 1966-67 Federal Budget.

Tijuana River Basin Project. This proposed San Diego County project is being handled by the International Boundary Commission and the State Department. Although substantial land enhancement benefits raise questions concerning state assistance, the project should proceed to authorization and construction.

Projects and Areas Recommended for Investigation

Specific projects recommended for detailed investigation and areas recommended for comprehensive, basin-wide study are discussed in this section.

Spencer and Dos Rios Reservoirs. These reservoirs, to be constructed on the Middle Fork of the Eel River, are authorized features of the State Water Project. Bulletin No. 159-65 recommended that studies be accelerated to determine the feasibility of constructing them for flood control in advance of the need for water supply. The funds available for the investigation during the 1965-66 fiscal year have been increased by 50 percent, and the same high level of expenditure will be maintained in 1966-67. A report on the feasibility of advancing the construction schedule will be made to the Legislature in January 1967.

English Ridge Reservoir. The Bureau of Reclamation expects to complete its feasibility level investigation of this Eel River Dam and Reservoir in December 1966. Flood control is being included as a project purpose.

Butler Valley Project. This project on the Mad River is being investigated by the Corps of Engineers. The project would provide water supplies and flood protection for the Eureka-Arcata area. The study is currently funded and is scheduled for completion in 1968.

Paskenta-Newville Project. The Bureau of Reclamation has initiated feasibility level studies of this proposed Upper Sacramento River Basin Project on Thomes Creek and the North Fork of Stony Creek. The studies are scheduled for completion in December 1966. The Department has also intensified its studies of the project looking toward possible state or joint state-federal construction. The Corps of Engineers has completed studies of flood hydrology and flood damages and flood control benefits. These studies have been made available to both the Bureau and the Department.

Upper Sacramento River Tributary Reservoirs. The Department's 1965 proposal to initiate feasibility level investigations of these reservoirs was not approved. The Corps of Engineers is currently conducting an investigation of the Upper Sacramento area with initial emphasis on the Cottonwood Creek Basin. The investigation is scheduled for completion in 1969. The Department is now proposing that it make a complete reevaluation of the Upper Sacramento River Basin. The objective of the study is to prepare a new flood control plan which will replace the plan based on Iron Canyon Reservoir. This study was initiated in July 1966.

Sacramento Valley and Sacramento-San Joaquin Delta. The Sacramento Valley is included in the Corps of Engineers' Northern California Streams Investigation. This investigation is funded and is scheduled for completion in 1969. The Corps of Engineers also has an active investigation of the Sacramento-San Joaquin Delta in progress. This study is scheduled for completion in 1966.

San Joaquin Valley. The Corps of Engineers has authorization for a comprehensive reevaluation of this area but it is not included in the proposed 1966-67 Federal Budget.

Eel River Basin. The Corps of Engineers is actively studying this basin to determine flood control damages and potential project benefits. Initial project development emphasis is being placed on the proposed Sequoia Reservoir, with a comprehensive basin-wide investigation scheduled for completion in 1969. As noted above, the Department and the Bureau of Reclamation are both conducting feasibility level investigations of projects in the Eel River Basin; the Department of Spencer and Dos Rios Reservoirs, the Bureau of English Ridge Reservoir.

Klamath River Basin. The Corps of Engineers' investigation of this basin is funded this year and is included in the proposed 1966-67 Federal Budget. The completion date for the study has not been set.

Trinity River Basin. The Bureau of Reclamation's existing Trinity Reservoir provides some flood protection in the basin. The need for additional protection will be studied under the Northern California Streams Investigation.

Mad River Basin. The Corps of Engineers' study of this basin includes the Butler Valley Project discussed above. The study is funded and is scheduled for completion in 1968.

Smith River Basin. The Corps of Engineers' authorized study of this basin is funded this year and is included in the proposed 1966-67 Federal Budget. No completion date has been set.

Russian River Basin. This Corps of Engineers' investigation has been going on several years. Interim reports recommending Warm

Springs and Knights Valley Reservoirs have already been produced.

The final report is scheduled for completion in 1967.

Federal Flood Control Appropriations

Most of the projects and investigations described above are being constructed or conducted by federal agencies, primarily the Corps of Engineers. Federal appropriations for flood control are of vital importance to California. Since California supports the construction of flood control projects by reimbursing the costs of rights-of-way and relocations for channel improvement and levee projects to participating local agencies, federal appropriations also have a fiscal impact on the State. The State's concern with flood control was reflected in the passage of Senate Resolution No. 249 at the 1965 Session of the Legislature. This resolution called for a study of the State's flood control assistance program and the assistance programs of the other states.

In order to determine whether or not the State's financial assistance program has helped improve the State's flood control position, a study of the federal flood control construction appropriations in each of the states is being made. The individual states were contacted to determine the amount of state assistance, if any, given to the projects which require local participation. The period selected for the study was fiscal years 1960-61 through 1964-65.

While not yet complete, the study revealed that California led the Nation in obtaining total Corps of Engineers' appropriations for both types of federal flood control projects--those which require local

participation and those which do not. California received \$188 million during the period. Pennsylvania was second with \$175 million, followed by Kansas, Texas, and Arkansas with \$146 million, \$136 million, and \$117 million, respectively. During the same period, California spent \$55 million and Pennsylvania spent \$1 million in state funds in support of the projects which require local participation. The other three states do not participate in flood control projects.

Since the State of California has assumed such a significant role in the flood control program, as evidenced by the ratio of federal dollars to state dollars, it is appropriate that the State make recommendations concerning federal flood control appropriations. From California's viewpoint, the proposed 1966-67 Federal Budget is inadequate with respect to California's flood problems. It is recognized, of course, that national considerations must determine the portion of the budget which can be devoted to flood control. Reductions in civil works expenditures may be necessary to support larger military expenditures. This can be particularly true of the large capital outlays necessary for construction. It is hard to conceive, however, that the small appropriations needed for design of authorized projects could adversely affect military or domestic programs. Eight Corps of Engineers' flood control projects in California were authorized by the Flood Control Act of 1965, but funds for design are included for only three of them in the proposed 1966-67 budget. Funds for design of all authorized projects should be made available. Unless these funds are

made available and the design of authorized projects does not proceed on a timely basis, the "pipeline" will be empty when the time comes to increase the portion of the budget devoted to construction of flood control projects.

Planning and Operations Considerations

In addition to projects and investigations, there are several important areas where increased activity would strengthen the State's flood control position. A number of recommendations were made in Bulletin No. 159-65 concerning these areas. The following sections discuss the current status of planning and operations considerations recommended in the bulletin.

Statewide Flood Control Plan

The most important planning recommendation in Bulletin No. 159-65 was that a statewide flood control plan be prepared and maintained on a current basis. The statewide flood control plan is the heart of a planned program approach to flood control which will maximize the benefits resulting from the expenditure of public funds.

The Department has been given authority to prepare a statewide flood control plan and to initiate a planned program approach to flood control. Many sections of the California Water Code direct the Department to study all phases of water resources development including flood control. Sections 12580, 12616, and 12627 give particular emphasis to the statewide interests and responsibilities of the Department.

The Department will initiate studies leading to a statewide flood control plan under its statewide planning programs. This work will begin in fiscal year 1966-67.

Flood Forecasts and Warnings for the North Coast

The large, uncontrolled streams in the North Coastal area usually take a number of hours to reach flood stages. An efficient and timely flood forecasting and warning system can greatly reduce the chance of loss of lives and damage to livestock and movable property. Several recommendations in Bulletin No. 159-65 called for a program to strengthen the flood forecast and warning system for the North Coast.

In carrying out these recommendations, the Department has, in cooperation with the U. S. Weather Bureau, established a satellite flood center in Eureka to supervise the data collection network and to disseminate forecasts and warnings. A modern, expanded telemetering network has been authorized by both the Federal and State Governments as a cooperative project. Appropriations for the expansion of the network total \$350,000. The system has been designed, and the equipment for it is in the process of manufacture and delivery. Installation of the system is currently underway.

The U. S. Weather Bureau has been asked to report on the advisability of stationing a permanent weather ship off the Northern California Coast. Preliminary investigations are now being made to determine the feasibility of using a synchronous satellite to improve data gathering capabilities. Additionally, the U. S. Weather Bureau has initiated work to install a weather radar facility atop Mt. Ashland near the California-Oregon border. This radar would supplement the

existing Sacramento radar to provide better coverage for Northern California in general and the North Coast area in particular.

The performance of this improved flood forecasting and warning system will be continuously monitored. As the operation of the system reveals a need for more information at other strategic locations, recommendations for improvements will be made.

Flood Plain Management

Bulletin No. 159-65 recommended the enactment of strong state flood plain management regulation legislation. The passage of the Cobey-Alquist Flood Plain Management Act by the 1965 Session of the Legislature initiated work by the State in this field. The Act declares that it is state policy that the flood plains should be properly managed, encourages the local agencies to accept responsibility for management, and makes the establishment of regulations a condition of receiving state financial assistance for federal flood control projects.

Application of the Act is now being made. As the Department and The Reclamation Board gain experience in administration of the Act, the need for modification of its provisions may become apparent. The Department will make recommendations to the Legislature for modification of the Act if changes appear desirable.

An increase in federal funds available for the Corps of Engineers to make flood plain information studies was also recommended in the Bulletin. These funds were increased from \$27,500 in fiscal year 1964-65 to \$73,000 in fiscal year 1965-66. The Department has requested and received approval for a statewide flood plain information

study. As the agency designated by the Governor to set priorities for carrying out these studies, the Department will be able, within the framework of the statewide application, to designate the areas of greatest need. The backlog created by having the entire State eligible for study will also give the Corps of Engineers a firm basis for scheduling manpower and funding needs.

Flood Fight Responsibilities and Aid Programs

Chapter IV of Bulletin No. 159-65 describes the flood fight responsibilities of the agencies at the various levels of government, and Chapter V describes the aid programs available to repair flood damages. The organization for both of these functions worked well in the December 1964 flood and in previous floods and are considered satisfactory.

Review of Flood Control Criteria

The bulletin recommended a review of the criteria for economic justification and financial feasibility of flood control projects. This work is proposed for inclusion in the flood control planning program. Recommendations to the Corps of Engineers will be prepared after detailed review of the existing criteria. These recommendations will give particular emphasis to the element of protection of human life and the need to advance the construction of multiple purpose projects in the interests of flood control while deferring the repayment by water users of the costs allocated to water conservation. The flood frequency curves used in studies of the feasibility of flood control projects would also be reviewed.

Recreational Use of Existing Levees

There is a large demand for recreational use of existing flood control levees, particularly in the Sacramento-San Joaquin Delta. While use of these levees can greatly increase the opportunities for outdoor recreation, it must always be kept in mind that the primary purpose of the levees is flood control and that this use must not be impaired. The Department is conducting a Pilot Levee Maintenance Study in an effort to develop ways of making multiple use of project levees compatible with the flood control purpose. Interim results show several promising methods of obtaining the desired results. The final report on the study is due in June 1967.

Watershed Management Programs

The final recommendation in Chapter VIII of Bulletin No. 159-65 was that special attention be given to watershed management programs on streams where the greatest flood damages are suffered. The Federal Soil Conservation Service, in cooperation with the Department, is completing a comprehensive investigation of the Middle Fork of the Eel River. They propose to expand their studies to the entire North Coast area.

APPENDIX A - PRECIPITATION

Table 20 Precipitation Comparison for Six Storms
December 1955, February 1958, February 1960,
October 1962, January-February 1963, December 1964

Table 20

Precipitation Comparison for Six Storms

Station	One Day			Two Days			Three Days			Four Days		
	Dec. 1955	Feb. 1958	Oct. 1960	Jan-Feb 1963	Dec. 1964	Dec. 1955	Feb. 1958	Oct. 1960	Jan-Feb 1963	Dec. 1955	Feb. 1958	Oct. 1960
<u>North Coast</u>												
Alderpoint	5.06	3.59	3.66	3.83	3.70	5.85	4.20	6.46	6.30	6.40	10.35	7.68
Cummings	7.00	4.26	6.00	4.03	5.08	11.20	5.56	10.42	7.64	7.65	18.04	9.83
Gasquet RS	<u>1.29</u>	3.21	3.65	3.82	2.47	6.35	4.77	6.52	6.32	4.43	10.39	5.10
Mad River RS	4.04	2.50	3.80	3.94	4.63	<u>7.87</u>	4.64	7.25	6.67	6.93	14.77	--
Orleans	3.50	2.77	2.70	3.23	1.92	<u>7.38</u>	4.17	5.38	4.29	3.52	11.07	5.09
Scotia	<u>5.39</u>	2.82	2.05	1.93	1.86	5.13	7.19	4.09	3.76	2.99	<u>7.35</u>	4.46
<u>Russian River Basin</u>												
Cloverdale 3 SSE	6.25	3.53	3.30	<u>8.37</u>	3.30	3.97	5.93	4.30	<u>11.30</u>	6.33	7.82	10.19
Guerneville	7.68	3.45	<u>8.40</u>	5.30	3.03	3.70	4.34	9.44	7.58	5.89	6.45	8.71
Healdsburg	3.73	4.39	2.86	4.89	5.08	4.28	6.65	5.24	8.34	<u>9.97</u>	8.35	10.75
Saint Helena	<u>5.76</u>	3.27	4.30	5.58	4.63	4.02	7.99	6.00	<u>9.08</u>	8.16	7.60	9.45
<u>Clear Lake</u>												
Hobergs	<u>12.72</u>	5.70	4.95	8.32	6.12	6.17	<u>18.77</u>	8.20	6.96	13.66	11.81	12.19
Middletown	<u>9.22</u>	--	--	6.80	5.12	6.42	<u>13.55</u>	--	--	9.88	9.21	12.58
<u>Northern Sacramento Valley</u>												
Red Bluff NB AP	.96	<u>2.14</u>	1.28	1.90	1.23	1.08	1.79	2.66	1.47	<u>3.16</u>	2.41	1.89
Shasta Dam	8.24	4.34	3.18	3.54	2.64	<u>11.64</u>	12.28	5.03	4.26	6.22	5.01	<u>15.22</u>
<u>Feather River Basin</u>												
Brush Creek RS	8.68	3.39	8.55	<u>11.40</u>	4.99	9.41	11.93	4.57	10.29	<u>18.75</u>	9.78	14.56
Oroville Bridge	2.20	1.79	1.22	<u>4.63</u>	1.70	1.48	4.30	2.37	1.68	<u>8.53</u>	3.10	2.46
Portola	<u>4.18</u>	1.26	1.64	3.89	1.76	2.32	5.12	1.96	2.57	<u>6.34</u>	3.45	4.15
Quincy RS	4.62	3.54	3.22	<u>6.10</u>	3.47	5.33	8.59	4.43	4.68	<u>11.27</u>	6.34	8.29
Susanville AP	3.36	1.19	1.68	<u>4.70</u>	2.34	3.30	3.68	1.81	2.53	<u>8.34</u>	3.59	6.13

Dates of storm periods used Dec. 15-31, 1955
Feb. 1-28, 1958
Feb. 6-10, 1960
Oct. 9-14, 1962
Jan. 29-Feb. 2, 1963
Dec. 18-31, 1964

The underlined value is the maximum value for the six storms listed.

Table 20 (Continued)

Station	One Day			Two Days			Three Days			Four Days			Jan-Feb 1963	Dec. 1964		
	Dec. 1955	Feb. 1956	Oct. 1960	Jan-Feb 1963	Dec. 1964	Dec. 1955	Feb. 1958	Oct. 1960	Jan-Feb 1963	Dec. 1964	Dec. 1955	Feb. 1960			Oct. 1962	
<u>Yuba River Basin</u>																
Campville RS	8.85	3.20	<u>8.50</u>	6.94	8.83	13.18	3.64	10.90	13.32	<u>16.03</u>	16.38	4.26	12.25	<u>18.47</u>	18.23	
Danville RS	5.83	5.32	6.50	8.52	7.53	10.80	6.46	8.33	<u>15.81</u>	14.43	14.22	6.96	9.39	<u>21.32</u>	--	
Lake Spaulding	8.84	2.81	7.10	7.67	<u>11.55</u>	16.63	5.50	9.41	15.03	<u>17.52</u>	18.64	5.78	11.32	18.37	<u>23.05</u>	
Strawberry Valley	9.50	4.40	7.38	11.32	<u>11.75</u>	17.00	6.63	12.90	<u>20.56</u>	17.14	19.55	6.82	14.91	<u>24.27</u>	23.73	
<u>American River Basin</u>																
Blue Canyon WB AP	7.44	3.54	5.50	7.37	<u>9.33</u>	13.36	5.11	10.41	13.81	<u>15.24</u>	18.55	5.12	12.06	19.55	<u>19.12</u>	
Georgetown RS	6.56	2.89	6.66	7.00	<u>7.91</u>	12.01	3.19	9.56	11.82	<u>12.32</u>	15.79	4.17	10.86	15.74	<u>12.97</u>	
Pacific House	5.34	2.58	4.33	4.51	<u>7.14</u>	10.66	2.84	8.20	7.28	<u>10.87</u>	<u>14.74</u>	4.25	10.12	9.19	13.01	
<u>Nokelume-Stanislau River Basins</u>																
Calaveras Bir Trees	6.32	3.60	3.57	4.13	6.32	12.18	4.50	6.62	5.43	<u>15.95</u>	16.26	5.46	8.66	6.75	<u>19.48</u>	
Salt Springs PH	<u>6.18</u>	2.05	3.90	2.63	3.59	10.39	3.15	6.11	4.01	<u>10.56</u>	13.72	3.35	6.74	5.32	<u>14.90</u>	
<u>Sacramento Valley Floor</u>																
Sacramento WB City	2.41	1.91	.86	<u>3.63</u>	1.79	3.81	2.93	1.25	<u>5.80</u>	3.09	4.11	2.93	1.45	<u>6.69</u>	3.60	
Marysville	2.27	1.75	.69	<u>4.24</u>	.74	4.10	2.02	.90	<u>7.22</u>	3.38	4.31	2.25	.95	<u>9.26</u>	3.58	
					</											

Dates of storm periods used

Dec. 15-31, 1955

Feb. 1-28, 1958

Feb. 6-10, 1960

Oct. 9-14, 1962

Jan. 20-Feb. 2, 1963

Dec. 18-31, 1964

The underlined value is the maximum value for the six storms listed.

APPENDIX B - RUNOFF

Table 21 Peak Flows and Stages

Table 22 Reservoir Operations During Period
December 20, 1964-January 20, 1965

Appendix B

Table 21

Peak Flows and Stages
(Preliminary Data, Subject to Revision)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
North Coastal Area									
Middle Fork Smith River at Gasquet	130	1911-18 1958-	USGS	12/2/62	12.28	18,100 ^r	12/22/64	22.2 ^h	41,100**
Smith River near Crescent City	609 ^r	1931-	USGS	12/22/55	41.20	165,000	12/22/64	48.5 ^h	228,000**
Shasta River near Yreka	793 ^r	1933-41 1944-	USGS	12/22/55	9.43	6,090	12/22/64	12.92	21,500 ^{c**}
Scott River near Fort Jones	653 ^r	1941-	USGS	12/22/55	21.40	38,500	12/22/64	25.34 ^h	54,600**
Klamath River nr. Seiad Valley	6,980	1912-25 1951-	USGS	12/22/55	29.2 ^h	122,000 ^c	12/22/64	33.75 ^h	165,000 ^{c**}
South Fork Salmon River near Forks of Salmon	252	1957-	USGS	12/22/55	18.86 ^h	24,200	12/22/64	21.73 ^h	31,400**
North Fork Salmon River near Forks of Salmon	203 ^r	1958-	USGS	12/2/62	14.27	10,500	12/22/64	28.2 ^h	25,100**
Salmon River at Somesbar	746	*1911-	USGS	12/22/55	28.80	84,000	12/22/64	43.4 ^h	133,000**
Klamath River at Somesbar	8,480	1927-	USGS	12/22/55	59.4 ^h	202,000 ^c	12/22/64	76.5 ^h	307,000 ^{c**}
Red Cap Creek near Orleans	56.1	1958-	USGS	12/2/62	10.69	5,340	12/22/64	-	15,000 ^{e**}
Bluff Creek near Weitchpec	74.6	1958-	USGS	12/22/55	13.7 ^h	20,200	12/22/64	-	27,000**
Trinity River above Coffee Creek, near Trinity Center	149	1957-	USGS	2/24/58 12/22/55	10.50 ^h 10.5 ^h	12,800	12/22/64	12.30 ^h	20,800**
Trinity River at Lewiston	728 ^r	1911-	USGS	12/22/55	27.3 ^h	71,600	12/22/64	3.33	254 ^c
North Fork Trinity River at Helena	151	1911-13 1957-	USGS DWR	1/12/59	19.66	13,500	12/22/64	27.93 ^h	35,800**
Trinity River nr. Burnt Ranch	1,439 ^r	1931-40 1956-	USGS	12/22/55	43.2 ^h	172,000	12/22/64	29.82	78,100 ^c
New River at Denny	173	1927-28 1959-	USGS	12/2/62	11.71	9,580	12/22/64	38.7 ^h	60,000 ^{e**}
South Fork Trinity R. at Forest Glen	208	1959-	USGS	12/22/55	25.26 ^h	33,800 ^r	12/22/64	27.7 ^h	41,200**

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
North Coastal Area (Continued)									
South Fork Trinity River near Hyampom	342	1956-	USGS	12/22/55	22.2 ^{h, b}	39,400	12/22/64	25.8 ^h	57,000 ^{e**}
Hayfork Creek near Hayfork	86.7 ^r	1956-	USGS	2/8/60	11.67	4,210	12/22/64	14.56	7,520 ^{**}
Hayfork Creek near Hyampom	378 ^r	1953-	USGS	12/22/55	18.00	25,300	12/22/64	19.14	28,800 ^{**}
South Fork Trinity River near Salyer	898 ^r	1911-13 1950-	USGS	12/22/55	39.4 ^h	65,100	12/22/64	47.6 ^h	95,400 ^{**}
Willow Creek at Willow Creek	43.3	1959-	USGS	1/20/64	9.86	5,260	12/22/64	25.3 ^h	17,000 ^{e**}
Trinity River near Hoopa	2,847 ^r	*1911-	USGS	12/22/55	36.90	190,000	12/22/64	40.3 ^h	231,000 ^{c**}
Klamath River near Klamath	12,100	*1910-	USGS	12/22/55	49.7 ^h	425,000 ^c	12/23/64	55.3 ^h	557,000 ^{c**}
Redwood Creek near Blue Lake	67.5	1953-58 1964-	USGS	12/21/55	13.68	12,100	12/22/64	16.05	16,400 ^{**}
Redwood Creek at Orick	278	1911-13 1953-	USGS	1/18/53 12/22/55	23.95 ^h 23.95	50,000 50,000	12/22/64	24.0 ^h	50,500 ^{**}
Little River at Crannell	44.3	1955-	USGS	1/20/64	10.83	7,930	12/22/64	11.06	8,240 ^{**}
Mad River near Forest Glen	143	1953-	USGS	12/22/55	24.5 ^h	39,200	12/22/64	16.80	20,100 ^c
North Fork Mad R. near Korbrel	40.5	1957-	USGS	1/20/64	15.75	8,400	12/22/64	20.02	15,400 ^{**}
Mad River near Arcata	484	1910-13 1950-	USGS	12/22/55	27.30 ^b	77,800	12/23/64	23.40	70,400 ^c
Jacoby Creek nr. Freshwater	6.07	1954-	USGS	12/30/54	7.20	1,670	12/22/64	6.83	1,530
Elk River near Falk	44.2	1957-	USGS	2/14/59	27.62	3,220	12/22/64	28.09	3,430 ^{**}
Eel River below Scott Dam, near Potter Valley	290	1922-	USGS	12/11/37	22.9 ^h	41,100 ^c	12/22/64	24.24 ^h	56,300 ^{c**}
Eel River at Van Arsdale Dam, near Potter Valley	349	*1909-	USGS	12/22/55	31.4 ^h	48,600 ^c	12/22/64	33.9 ^h	64,100 ^{c**}
Outlet Creek nr. Longvale	161 ^r	1956-	USGS	2/8/60	20.27	21,500	12/22/64	30.6 ^h	77,900 ^{**}
Eel River above Dos Rios	705	1950-	USGS	12/22/55	45.4 ^h	123,000 ^c	12/22/64	55.4 ^h	184,000 ^{c**}
Black Butte River near Covelo	162	*1951-	USGS	12/21/55	35.8 ^{h, b}	25,000	12/22/64	26.4 ^h	29,000 ^{**}

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
North Coastal Area (Continued)									
M. F. Eel River below Black Butte River, nr. Covelo	367	1951-	USGS	12/21/55	25.0 ^h	89,100	12/22/64	31.7 ^h	133,000**
Eel River below Dos Rios	1,484	1911-13 1951-	USGS	12/22/55	49.86	283,000 ^c	12/22/64	62.5 ^h	460,000 ^{c**}
North Fork Eel River near Mina	250	1953-	USGS	12/22/55	24.00	58,400	12/22/64	33.6 ^h	133,000**
Eel River at Alderpoint	2,079	1955-	USGS	12/22/55	72.5 ^h	376,000 ^c	12/22/64	87.2 ^h	561,000 ^{c**}
South Fork Eel R. nr. Branscomb	43.9	1946-	USGS	12/22/55	16.20	20,100	12/22/64	16.05	19,700
Tenmile Creek nr. Laytonville	50.3	1957-	USGS	12/22/55	22.9 ^h	16,300	12/22/64	21.30 ^h	14,500
South Fork Eel R. near Miranda	537	1939-	USGS	12/22/55	42.7 ^h	173,000	12/22/64	46.0 ^h	199,000**
Bull Creek nr. Weott	28.1	1960-	USGS	1/31/63	16.12	4,120	12/22/64	20.6 ^h	6,520**
Larabee Creek near Holmes	84.1	1959-	USGS	2/8/60	12.40	10,000	12/22/64	13.05	11,400**
Eel River at Scotia	3,113	*1910-	USGS	12/22/55	61.90	541,000	12/23/64	72.0 ^h	752,000 ^{c**}
South Fork Van Duzen River nr. Bridgeville	36.2	*1951-	USGS	12/22/55	11.91 ^{b,h}	8,990	12/22/64	18.70	13,600**
Van Duzen River nr. Bridgeville	216	1950-	USGS	12/22/55	21.3 ^h	43,500	12/22/64	22.6 ^h	48,700**
Mattole River nr. Petrolia	240	*1911-	USGS	12/22/55	29.60	90,400	12/22/64	27.86	78,500
Noyo River nr. Fort Bragg	106	1951-	USGS	12/22/55	25.64	22,000	12/22/64	26.30	24,000**
Rancheria Creek near Boonville	65.6	1959-	USGS	1/31/63	18.30	13,900	12/22/64	20.52	20,000**
Navarro River near Navarro	303	1950-	USGS	12/22/55	40.60	64,500	12/22/64	38.64	52,100
South Fork Gualala River nr. Annapolis	161	1950-	USGS	12/22/55	24.57	55,000	12/21/64	15.94	21,400
Russian River near Ukiah	99.7	*1911-	USGS	12/21/55	21.0	18,900	12/22/64	19.44	17,900
East Fork Russian River nr. Calpella	93.0	1941-	USGS	12/21/55	15.06 ^b	13,300 ^c	12/22/64	20.21	18,700 ^{c**}

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
North Coastal Area (Continued)									
Russian River near Hopland	362	1939-	USGS	12/22/55	27.00	45,000	12/22/64	26.01	41,500 ^c
Feliz Creek near Hopland	31.1	1958-	USGS	1/31/63	13.43	2,710	12/22/64	14.10	6,080**
Russian River nr. Cloverdale	502	1951-	USGS	12/22/55	30.9 ^h	53,000	12/22/64	31.60	55,200 ^{c**}
Big Sulphur Cr. near Cloverdale	82.3	1957-	USGS	12/22/55	22.2 ^h	20,000	12/22/64	15.08	15,700
Russian River nr. Healdsburg	793	1939-	USGS	2/28/40	30.0	67,000	12/23/64	27.00	71,300 ^{c**}
Dry Creek near Cloverdale	87.8	1941-	USGS	1/31/63	17.91	17,700	12/22/64	18.09	18,100**
Dry Creek nr. Geyserville	162	1959-	USGS	1/31/63	17.50	32,400	12/22/64	17.4 ^h	31,800
Santa Rosa Creek near Santa Rosa	12.5	1959-	USGS	2/8/60	13.35 ^h	3,200	1/5/65	12.28	2,480
Russian River nr. Guerneville	1,340	*1939-	USGS	12/23/55	49.7 ^h	90,100	12/23/64	49.6 ^h	93,400 ^{c**}
Austin Creek near Cazadero	63.1	1959-	USGS	2/13/62	20.6 ^j	15,100	12/21/64	16.80	12,100
San Francisco Bay Area									
Walker Creek nr. Tomales	37.1	1959-	USGS	1/31/61 2/13/62 1/20/64	18.18 17.72 18.52	3,430 3,430 3,430	1/ 5/65	19.86	4,340**
Corte Madera Creek at Ross	18.1	1951-	USGS	12/22/55	17.45	3,620	1/ 5/65	11.57	1,400 ^c
Novato Creek near Novato	17.5	1946-	USGS	1/20/64	8.74	1,330	1/ 5/65	7.53	1,120 ^c
Sonoma Creek at Boyes Hot Springs	62.2	1955-	USGS	12/22/55	17.10	8,880	1/ 5/65	15.56	7,520
Napa River nr. St. Helena	81.4 ^r	*1929-	USGS	12/22/55	16.17	12,600	1/ 5/65	14.96	11,800
Dry Creek near Napa	17.4	1951-	USGS	2/24/58	8.11	3,460	1/ 5/65	7.62	2,970
Napa River near Napa	218	*1929-	USGS	1/31/63	27.59	16,900	1/ 5/65	25.10	14,300 ^c
Redwood Creek near Napa	9.81	1958-	USGS	1/31/63	9.90	1,330	1/ 5/65	10.44	1,450**

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
San Francisco Bay Area (Continued)									
San Ramon Creek at San Ramon	5.89	1952-	USGS	10/13/62	16.98	1,600	12/23/64	6.30	579
San Ramon Creek at Walnut Creek	50.8	1952-	USGS	1/31/63	14.40	7,980	12/23/64	8.47	2,550
Walnut Creek at Walnut Creek	79.2	1952-	USGS	4/2/58	20.2	12,200	1/5/65	6.72	4,200 ^c
San Lorenzo Creek at Hayward	37.5	*1939-	USGS	10/13/62	19.73 ^h	7,460	1/5/65	10.35	1,420 ^c
Arroyo Mocho nr. Pleasanton	143	1962-	USGS	2/1/63	8.60	1,760	1/7/65	4.89	265
Arroyo Valle nr. Livermore	147	*1912-	USGS	12/23/55	13.93 ^h	18,200	12/23/64	5.62	1,980
Arroyo Valle at Pleasanton	171	1957-	USGS	4/3/58	25.36	11,300	12/23/64	14.35	2,040
Alameda Creek near Niles	633	1891-	USGS	12/23/55	14.9	29,000 ^c	12/23/64	8.01	5,320 ^c
Patterson Creek at Union City	-	1958-	USGS	2/1/63	20.4 ^h	10,500 ^c	12/23/64	15.98	4,580 ^c
Alameda Creek at Union City	653	1958-	USGS	2/1/63	19.25 ^h	1,770 ^c	12/23/64	15.98	1,070 ^c
Coyote Creek near Madrone	196	*1902-	USGS	3/7/11	-	25,000	12/14/64	2.46	77 ^c
Upper Penitencia Creek at San Jose	21.5	1961-	USGS	3/28/63	3.53	295	12/23/64	6.5 ^h	800 ^{c**}
Alamitos Creek nr. New Almaden	31.9	1958-	USGS	4/2/58	9.67	4,300 ^c	1/6/65	4.13	427 ^c
Los Gatos Cr. at Los Gatos	38.6	*1929-	USGS	2/27/40	14.71 ^b	7,110	1/5/65	4.75	92 ^c
Guadalupe River at San Jose	146	1929-	USGS	4/2/58	16.55	9,150 ^c	1/5/65	4.26	1,340 ^c
Saratoga Creek at Saratoga	9.22	1933-	USGS	12/22/55	6.40	2,730	1/5/65	4.40	535 ^c
Matadero Creek at Palo Alto	7.24	1952-	USGS	12/22/55	9.60 ^b	854	1/5/65	2.24	219
San Francisquito Creek at Stanford University	37.5	*1930-	USGS	12/22/55	13.60	5,560	12/23/64	5.35	1,120 ^c
Redwood Creek at Redwood City	1.82	1959-	USGS	1/31/63	9.36	644	12/23/64	4.08	110
Pescadero Creek near Pescadero	45.9	1951-	USGS	12/23/55	21.27	9,420	1/5/65	14.26	3,310

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1966		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Central Coastal Area									
San Lorenzo River at Big Trees	111	1936-	USGS	12/23/55	22.55	30,400	1/5/65	12.93	8,450 ^c
Branciforte Creek at Santa Cruz	17.3	1940-43 1952-	USGS	12/22/55	22.04	8,100	12/22/64	11.98	2,170
Soquel Creek at Soquel	40.2	1951-	USGS	12/23/55	22.33	15,800	12/22/64	10.47	3,180
Llagas Creek nr. Morgan Hill	19.6	1951-	USGS	4/2/58	8.45	3,190 ^c	12/14/64	1.63	37 ^c
Bodfish Creek near Gilroy	7.40	1959-	USGS	1/31/63	8.25	1,240	12/22/64	8.08	913
Tres Pinos Creek near Tres Pinos	206	1939-	USGS	4/4/41	7.75	8,060	1/7/65	5.58	1,650
San Benito River near Hollister	586	1949-	USGS	4/3/58	16.30	11,600	1/7/65	5.46	906 ^c
Pajaro River at Chittenden	1,186	1939-	USGS	12/24/55	32.46	24,000 ^c	1/6/65	12.80	3,300 ^c
Corralitos Creek near Corralitos	10.6	1957-	USGS	4/2/58	7.55	1,970	12/22/64	6.00	990
Corralitos Creek at Freedom	27.8	1956-	USGS	12/22/55	15.6 ^h	3,620	12/22/64	9.65	1,800
Salinas River near Pozo	74.1	1942-	USGS	1/21/43	13.35	7,210	1/6/65	6.12	676
Salinas River above Pilitas Creek nr. Santa Margarita	114	1942-	USGS	4/3/58	8.68	4,720 ^c	1/6/65	1.17	18 ^c
Jack Creek nr. Templeton	25.3	1949-	USGS	1/25/56	9.56	5,040	1/6/65	6.42	1,440
Salinas River at Paso Robles	389	1939-	USGS	3/9/43	16.2 ^b	14,200 ^c	1/6/65	11.78	3,420 ^c
Estrella River near Estrella	924 ^r	1954-	USGS	4/6/58	7.20	8,850	1/10/65	2.05	6.
Nacimiento River near Bryson	140	1955-	USGS	12/23/55	24.63	30,300	1/6/65	14.80	11,700
San Antonio River at Pleyto	284	*1922-	USGS	4/3/58	6.44	19,100	1/6/65	4.49	3,900
Salinas River near Bradley	2,536 ^r	1948-	USGS	4/3/58	12.53	28,400 ^c	1/7/65	7.42	4,720 ^c
Arroyo Seco near Soledad	244	1901-	USGS	4/3/58	16.40	28,300	1/6/65	11.40	7,700

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Central Coastal Area (Continued)									
Salinas River near Spreckels	4,157 ^r	*1900-	USGS	2/12/38 1/16/52	25.0 26.85	75,000 ^o -	1/8/65	14.25	2,830 ^c
Big Sur River near Big Sur	46.5	1950-	USGS	4/2/58	11.56	5,680	1/6/65	7.37	2,100
Arroyo de la Cruz near San Simeon	41.4	1950-	USGS	12/23/55	12.40	17,700	1/6/65	9.04	6,680
Santa Rosa Creek near Cambria	12.5	1957-	USGS	2/1/60 12/?/55	10.36 ^h 15.2	2,520 -	1/6/65	7.40	1,730
Arroyo Grande at Arroyo Grande	102	1939-	USGS	1/15/52	11.97	5,370	1/7/65	3.78	432
Sisquoc River near Garey	472	1940-	USGS	1/23/43	8.46 ^b	13,000		No Flow ^c	
Santa Maria River at Guadalupe	1,742	1940-	USGS	1/16/52	8.18 ^b	32,800		No Flow ^c	
Santa Ynez River below Gibraltar Dam, nr. Santa Barbara	216	1920-	USGS	3/2/38	-	35,500 ^c	12/20/64	4.80	7.5 ^c
Santa Cruz Creek near Santa Ynez	73.9	1941-	USGS	2/9/62	9.75	4,520	1/7/65	4.49	143
San Jose Creek near Goleta	5.51	1941-	USGS	4/4/41	-	1,960	12/20/64	3.42	157
Atascadero Creek near Goleta	18.8 ^r	1941-	USGS	1/15/52	10.85	4,500	12/20/64	8.40	480
Carpinteria Creek near Carpinteria	13.1	1941-	USGS	1/15/52	9.75	2,440	12/20/64	4.29	58
Central Valley Area									
Sacramento River at Delta	425 ^r	1944-	USGS USBR	12/22/55	19.50	37,000	12/22/64	20.10	38,800 ^{**}
N. F. Pit River near Alturas	203 ^r	1929-32 1957-	USGS	10/14/62	11.07	2,530	12/22/64	7.82	1,660
Pit River near Bieber	2,475 ^r	*1904-	USGS	3/19/07	16.7	33,800	12/23/64	9.80	8,880 ^c
Pit River below Pit No. 4 Dam	4,647 ^r	1922-	USGS	12/12/37	17.90	30,200	12/24/64	15.68	22,000 ^c
Pit River near Montgomery Creek	4,945 ^r	1944-	USGS	12/23/55	14.12 ^b	37,100	12/24/64	-	28,000
Squaw Creek above Shasta Lake	64.0 ^r	1944-	USGS USBR	12/21/55	21.90	17,800	12/22/64	19.46	12,300

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Central Valley Area (Continued)									
McCloud River above Shasta Lake	604 ^r	1945-	USGS USBR	12/22/55	28.20	45,200	12/22/64	24.37	28,000
Sacramento River at Keswick	6,486 ^r	1938-	USGS DWR	2/23/40	47.2 ^b	186,000	12/27/64	27.59	54,000 ^c
Clear Creek at French Gulch	115	1950-	USGS	12/22/55	13.49	7,050	12/22/64	13.70	7,600**
Clear Creek near Igo	228	1940-	USGS	12/21/55	13.75	24,500	12/22/64	9.23	9,940 ^c
Cow Creek near Millville	425	1949-	USGS	12/27/51	21.55	45,200	12/22/64	18.46	30,300
Cottonwood Creek near Cottonwood	922	1940-	USGS	3/1/41	15.4 ^b	52,300	12/22/64	19.64	56,500**
Battle Creek below Coleman Fish Hatchery near Cottonwood	358	1961-	USGS	12/11/37	15.8 ^{h, b}	35,000	12/22/64	12.52	9,330
Paynes Creek nr. Red Bluff	92.7	1949-	USGS	12/1/61	11.33	10,600	12/22/64	8.67	4,900
Sacramento River near Red Bluff	9,300	1892-	USGS	2/28/40	38.9	291,000	12/22/64	28.15	170,000 ^c
Sacramento River at Red Bluff	-	1878-	USGS DWR USWB	2/28/40	32.2	-	12/22/64	27.7 ⁿ	-
Red Bank Creek near Red Bluff	93.5	1959-	DWR USBR	1/31/63	8.67	5,770	1/5/65	10.21	12,200**
Antelope Creek near Red Bluff	123	1940-	USGS USCE	2/22/56	12.43	11,500	12/22/64	13.05	8,990
Elder Creek near Paskenta	92.9 ^r	1948-	USGS	2/24/58	13.90	11,700	12/22/64	13.23	10,300
Elder Creek at Gerber	136	1949-	USGS USBR	2/19/58	14.40 ^b	11,000	1/5/65	14.90	14,100**
Mill Creek near Los Molinos	131	*1909	USGS	12/11/37	23.4 ^h	23,000	12/22/64	15.26	12,800
Thomes Creek at Paskenta	194	1920-	USGS DWR	12/21/55	13.89	23,500	12/22/64	15.32	37,800**
Deer Creek near Vina	208	*1911	USGS DWR	12/10/37	19.2 ^h	23,800	12/22/64	14.67	18,800
Sacramento River at Vina Bridge	-	1945-	DWR USBR	2/25/58	89.42	147,000 ^c	12/23/64	90.92	162,000 ^{c, e}

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Central Valley Area (Continued)									
Sacramento River at Hamilton City	-	1945-	DWR USBR	12/11/37	150.7	350,000	12/23/64	49.56	150,900 ^{c,e}
Big Chico Creek near Chico	72.5	1930-	USGS	12/10/37	16.6 ^b	8,260	1/5/65	15.36	9,580**
Stony Creek near Fruto	599	1901-12 1960-	USGS	2/2/09	16.3 ^b	36,000	12/23/64	15.49	40,200 ^{c**}
Stony Creek near Hamilton City	777	1940-	USGS	2/25/58	18.31	39,900 ^c	12/24/64	14.48	18,700 ^c
Sacramento River at Ord Ferry	-	*1921-	DWR	2/28/40	121.7	370,000	12/23/64	118.72	182,000 ^{c,e}
Sacramento River at Butte City	-	*1921-	USGS DWR	2/7/42	96.87	170,000	12/24/64	94.89	126,000 ^c
Moulton Weir Spill to Butte Basin	-	*1935-	DWR	2/20/58 2/26/58	83.66 83.66	36,000 ^d 36,000 ^d	12/24/64	82.42	25,800 ^d
Colusa Weir Spill to Butte Basin	-	*1935-	DWR	2/8/42	70.40	86,000 ^d	1/7/65	68.10	69,600 ^d
Sacramento River at Colusa	-	1940-	USGS DWR	2/8/42	69.20	49,000 ^c	1/7/65	67.07	43,900 ^c
Colusa Basin Drain at Highway 20	-	1924-	DWR	2/21/58	51.93	25,400 ^e	1/8/65	49.26	3,390
Butte Creek near Chico	147	1930-	USGS	12/22/55	13.35	18,700	12/22/64	14.12	21,200**
Butte Slough to Sutter Bypass at Mawson Bridge	-	*1934-	DWR	3/1/40	68.9	210,000	12/25/64	62.45	101,500
Sutter Bypass at Long Bridge	-	1914-	DWR	3/1/40	57.7	210,000	12/25/64	53.23	-
Tisdale Weir Spill to Sutter Bypass	-	1940-	DWR	3/1/40	53.35	25,700 ^d	12/25/64	49.73	24,600 ^{d,e}
Sacramento River below Wilkins Slough	-	1938-	USGS	2/27/58	51.41	28,900 ^c	12/25/64	49.91	27,000 ^c
Sacramento River at Knights Landing	-	1940-	USGS DWR	12/8/42 12/3/60	41.83 ^k 30.31	- 30,000 ^c	12/26/64	40.60	27,300 ^c
Big Grizzly Creek near Portola	45.5	*1925-	USGS	2/1/63	8.03	4,080	12/22/64	7.11	2,530
Middle Fork Feather River near Clito	686	1925-	USGS	2/1/63	16.19	14,500	12/24/64	14.82	11,100
Middle Fork Feather River near Merrimac	1,062 ^r	1951-	USGS	2/1/63	21.65	65,400	12/22/64	26.5 ^h	86,200**

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Central Valley Area (Continued)									
South Fork Feather River at Enterprise	132	1911-	USGS	12/22/55	21.60	19,200	12/22/64	17.43	11,800
North Fork Feather River near Prattville	493	*1905-	USGS	3/19/07	16.2 ^b	10,000	12/22/64	2.74	46 ^c
Butt Creek above Almanor-Butt Creek Tunnel, near Prattville	68.6	1936-	USGS	12/11/37	6.48 ^b	2,320	12/22/64	5.52	3,580**
Indian Creek near Crescent Mills	739	*1906-	USGS	3/19/07	20.2 ^{b,m}	25,000	12/22/64	16.70	20,000
Spanish Creek above Blackhawk Creek, at Keddle	184	1933-	USGS	2/1/63	13.37	15,000	12/22/64	13.53	15,400**
North Fork Feather River at Pulga	1,953	*1910-	USGS	12/23/55	35.60	72,400 ^{c,g}	12/22/64	35.80	73,000 ^c
West Branch Feather River near Paradise	113	1957-	USGS DWR	1/31/63	23.35	21,200	12/22/64	26.2	25,500**
Feather River at Oroville	3,626 ^r	1901-	USGS DWR	3/19/07	39.3 ^{b,m}	230,000	12/23/64	25.2	158,000 ^c
Feather River near Gridley	-	*1929-	DWR	12/23/55	102.25	-	12/23/64	100.43	151,000 ^c
South Honcut Creek near Bangor	30.6 ^r	1950-	USGS	10/13/62	12.40	8,280	12/26/64	19.25	17,000**
Feather River at Yuba City	-	1944-	DWR	12/24/55	82.42	-	12/23/64	76.42	-
Middle Yuba River above Oregon Creek	162	1940-	USGS	1/31/63	18.55	31,600 ^c	12/22/64	16.26	22,900 ^c
Oregon Creek near North San Juan	34.4	1911-	USGS	12/22/55	11.90	5,390	12/22/64	12.88	10,300**
North Yuba River below Goodyears Bar	250	*1930-	USGS	2/1/63	23.8 ^h	40,000	12/22/64	23.0	37,600
North Yuba River below Bullards Bar Dam	487	1940-	USGS	1/31/63	42.0 ^h	83,000 ^c	12/22/64	40.45	91,600 ^c *
South Yuba River nr. Cisco	51.8	1942-	USGS	1/31/63	20.6 ^h	18,400	12/23/64	17.40	14,300
South Yuba River at Jones Bar, near Grass Valley	310	1940-48 1959-	USGS	1/31/63	21.5 ^h	40,000 ^c	12/22/64	25.0	53,600 ^c *

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Central Valley Area (Continued)									
Yuba River at Englebright Dam	1,109 ^r	1941-	USGS PG&E	2/1/63	544.84	150,000 ^{c, f}	12/22/64	546.0 ⁿ	171,700 ^{c, f**}
Deer Creek near Smartville	84.6	1935-	USGS	10/13/62	13.77	11,600 ^c	12/22/64	11.85	8,260 ^c
Yuba River near Marysville	1,340	*1940-	USGS	12/23/55	88.85	160,000 ^c	12/23/64	90.15	180,000 ^{c**}
Bear River near Auburn	140	1940-	USGS	12/22/55	16.56 ^b	19,700	12/22/64	12.98	6,950 ^c
Bear River nr. Wheatland	292	1928-	USGS	12/22/55	19.30 ^b	33,000	1/6/65	10.53	12,700 ^c
Feather River at Nicolaus	5,923 ^r	1943-	USGS DWR	12/23/55	51.60	357,000 ^c	12/23/64	51.55	281,000 ^c
Fremont Weir (West End)Spill to Yolo Bypass	-	*1935-	DWR	12/23/55	39.72	293,800 ^d	12/25/64	39.53	248,000 ^d
Sacramento River at Verona	-	1929-	USGS DWR	3/1/40	41.20	79,200 ^c	12/25/64	39.65	74,200 ^c
Sacramento Weir Spill to Yolo Bypass, near Sacramento	-	*1939-	USGS DWR	3/26/28 12/23/55	31.83 33.01	118,000 ^d -	12/25/64	32.30	85,300 ^d
North Fork American River at North Fork Dam	343	1941-	USGS	1/31/63	11.30	59,700 ^c	12/23/64	11.87	65,400 ^{c**}
Rubicon River near Foresthill	311	1958-	USGS	2/1/63	35.0 ^h	83,000	12/23/64	74 ^{p, h**}	-
Middle Fork American River near Foresthill	534	1958-	USGS	2/1/63	38.00	113,000	12/23/64	69 ^{p, h**}	-
Middle Fork American River near Auburn	612	1911-	USGS	2/1/63	43.1 ^h	121,000	12/23/64	60.4 ^h	250,000 ^{p**}
South Fork American River near Kyburz	193	1907, 1922-	USGS PG&E	2/1/63	10.53	15,500 ^{c, g}	12/23/64	10.92	17,400 ^{c, g**}
South Fork American River near Camino	501	1922-	USGS PG&E	12/23/55	32.6 ^h	49,800 ^c	12/23/64	21.01	36,000 ^c
South Fork American River near Lotus	673	1951-	USGS	12/23/55	21.37	71,800 ^c	12/23/64	20.00	61,500 ^c
American River at Fair Oaks	1,888 ^r	1904-	USGS	11/21/50	31.85 ^b	180,000	12/23/64	21.65	115,000 ^c

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Central Valley Area (Continued)									
Sacramento River at Sacramento	23,530	*1879-	USGS DWR USWB	11/21/50	30.14 ^b	104,000 ^c	12/25/64	29.36	99,600 ^c
Sacramento River at Walnut Grove	-	1929-	DWR	11/21/50	13.0 ^b	-	12/25/64	22.24	-
Adobe Creek nr. Kelseyville	6.39	1954-	USGS	1/31/63	9.22	1,450	12/22/64	9.11	1,500**
Kelsey Creek nr. Kelseyville	37.2	1946-	USGS	12/21/55	12.80	8,800	1/5/65	13.48	8,750
Cache Creek near Lower Lake	528	1944-	USGS	2/24/58	9.40	8,000 ^c	1/5/65	8.21	5,320 ^c
North Fork Cache Creek near Lower Lake	198	1930-	USGS	12/11/37	13.98 ^h	20,300	12/22/64	12.73	19,700
Cache Creek above Rumsey	-	1959-	DWR	1/31/63	18.30 ^h	26,700 ^c	1/5/65	21.4	59,000 ^c **
Cache Creek near Capay	1,042 ^r	1942-	USGS	2/24/58	20.90	51,600 ^c	1/5/65	19.74	44,300 ^c
Cache Creek at Yolo	1,138 ^r	1903-	USGS	2/25/58	33.11 ^b	41,400 ^{c,g}	1/6/65	30.55	37,700 ^c
Yolo Bypass near Woodland	-	1939-	USGS DWR	2/8/42	32.00	272,000	12/24/64	32.48	265,000
Dry Creek near Middletown	8.41	1959-	USGS	2/8/60	9.90	3,470	12/22/64	9.70	3,210
Putah Creek near Winters	5.74 ^r	1930-	USGS DWR	2/27/40	30.5	81,000	1/7/65	14.96	7,740 ^c
Yolo Bypass near Lisbon	-	1914-	DWR	12/24/55	23.4 ^b	304,800	12/25/64	24.68	350,000 ^c **
Sacramento River at Rio Vista	-	1906-	USCE DWR	12/25/55	10.2 ^b	-	12/26,27/64	8.83	-
North Fork Cosumnes River near El Dorado	205	1911-41 1948-	USGS	12/23/55	14.8	15,800 ^c	12/23/64	13.85	13,700 ^c
Middle Fork Cosumnes River near Somerset	107	1957-	USGS	2/1/63	16.20	11,800	12/23/64	17.8	11,300
South Fork Cosumnes River near River Pines	64.3	1957-	USGS	2/1/63	10.90	5,540	12/23/64	8.68	3,880

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Central Valley Area (Continued)									
Cosumnes River at Michigan Bar	536 ^r	1907-	USGS DWR	12/23/55	14.59	42,000	12/23/64	13.80	37,500
Cosumnes River at McConnell	724	1941-	USGS USBR DWR	12/23/55	46.26	54,000	12/23/64	45.35	32,200
Dry Creek near Galt	329	1926-33 1944-	USGS USBR DWR	4/3/58	15.28	24,000	12/23/64	14.36	14,500
Cole Creek near Salt Springs Dam	20.4	1927-42 1943-	USGS	2/1/63	9.88	5,730	12/23/64	10.21	6,140 ^{**}
South Fork Mokelumne River near West Point	75.1 ^r	1933-	USGS	12/23/55	14.8 ^{b,h}	6,920	12/23/64	10.19	4,850
Mokelumne River nr. Mokelumne Hill	544 ^r	*1901-	USGS	12/3/50	18.5	33,700 ^c	12/24/64	17.31	29,700 ^c
Mokelumne River at Woodbridge	661 ^r	1924-	USGS DWR	11/22/50	29.58	27,000 ^c	12/31/64	15.56	2,650 ^c
Mokelumne River near Thornton (Benson's Ferry)	2045	1959	DWR	12/24/55	18.00 ^b	-	12/24/64	15.6	-
Bear Creek near Lockeford	47.6 ^r	1930-	USGS DWR	4/3/58	15.13	2,930	1/6/65	14.47	2,410
South Fork Calaveras River near San Andreas	118	1950-	USGS	12/23/55	10.29	17,600	12/23/64	7.83	7,800
Calaveras River at Jenny Lind	393 ^r	1907-	USGS DWR	1/31/11	21.0 ^m	50,000	12/23/64	6.84	2,570 ^c
Cosgrove Creek at Valley Springs	21.1 ^r	1929-	USGS	12/23/55	8.96	3,240	12/23/64	6.82	1,650
Calaveras River at Bellota	-	1958-	DWR	4/2/50	19.3	1,570 ^c	12/24/64	7.89	283 ^{c,e,}
Mormon Slough at Bellota	-	1948-	DWR	4/2/58	20.65	15,400 ^c	12/23/64	8.76	3,330 ^c
Calaveras River near Stockton	-	1958-	DWR	4/4/58	9.20	632 ^c	12/24/64	9.56	391 ^{c,e}
Stockton Diverting Canal at Stockton	-	1944-	DWR	4/4/58 ^e	17.18 ^e	11,400 ^e	12/23/64	13.02	4,960 ^e
Duck Creek near Stockton	-	1950-	DWR	12/24/55	5.75 ^e	400	12/24/64	9.72	172 ^e

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Central Valley Area (Continued)									
South Fork Stanislaus River near Long Barn	66.9 ^r	1937-	USGS	11/21/50	9.3	4,900 ^c	12/24/64	7.20	2,350 ^c
Stanislaus River below Melones Powerhouse, near Sonora	905 ^r	1931-	USGS	12/23/55	29.0 ^h	62,800 ^c	12/24/64	24.35	38,700 ^c
Stanislaus River at Orange Blossom Bridge	-	1940-	DWR	11/21/50	30.05	52,000 ^c	12/24/64	26.36	38,800 ^c
Stanislaus River at Ripon	1,075	1940-	USGS DWR	12/24/55	63.25	62,500 ^c	12/25/64	62.26	32,800 ^c
South Fork Tuolumne River near Oakland Recreation Camp	87.0 ^r	1923-	USGS	12/23/55	10.9 ^h	11,900	12/23/64	6.27	2,120
Middle Fork Tuolumne River at Oakland Recreation Camp	73.5 ^r	1916-	USGS	12/23/55	11.05 ^h	4,920	12/23/64	7.05	1,420
Tuolumne River at Modesto	1,884	*1878-	USGS DWR	12/9/50	69.19	57,000 ^c	1/7/65	55.35	11,100 ^c
Orestimba Creek near Newman	134 ^r	1932-	USGS DWR	4/2/58	6.57 ^b	10,200	12/31/64	5.57	142
Merced River at Pohono Bridge, near Yosemite	321	1916-	USGS	12/23/55	21.52 ^h	23,400	12/23/64	16.96	18,000
South Fork Merced River near El Portal	241 ^r	1950-	USGS	12/23/55	18.70	46,500	12/23/64	13.62	14,200
Merced River at Bagby	911 ^r	1922-	USGS	12/23/55	26.80	92,500	12/23/64	14.79	33,800
Merced River nr. Stevinson	1,273 ^r	1940-	USGS USBR DWR	12/5/50	73.79	13,600 ^c	1/8/65	72.08	10,600 ^c
Chowchilla River at Buchanan Dam Site, near Raymond	235 ^r	1921-23 1930-	USGS DWR	12/23/55	16.50	30,000	12/23/64	11.16	8,400
Fresno River near Knowles	133 ^r	1911-13 1915-	USGS	12/23/55	11.52	13,300	12/23/64	5.61	2,810
Fresno River near Daulton	258 ^r	1941-	USGS USBR	12/23/55	12.64	17,500	12/23/64	6.73	3,460

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Sal Valley Area (Continued)									
ow Creek outh nr. ery	130	1952-	USGS	12/23/55	28.5 ^h	15,700 ^{c,r}	12/23/64	15.73	4,860 ^c
Joaquin River w Kerchoff house, near her	1,480	*1910-	USGS	12/23/55	51.0 ^h	92,200 ^c	12/23/64	20.76	8,750 ^c
Joaquin River w Friant	1,675	*1907-	USGS	12/11/37	23.80 ^b	77,200 ^c	12/27/64	2.19	69 ^c
Joaquin River Mendota	4,310	1939-	USBR	6/1/52	-	8,840 ^c	1/15/65	3.15	170 ^c
side Bypasa El Nido	-	1964-	DWR	-	-	-	1/8/65	11.79	1,740
Joaquin River remont Ford ge	7,619 ^r	1937-	USGS USBR DWR	4/6/58	74.91	5,910 ^c	1/10/65	64.62	3,120 ^c
Joaquin River Newman	9,524 ^r	1912-	USGS DWR	3/7/38	65.81	33,000 ^{c,g}	1/10/65	62.69	11,300 ^c
Joaquin River Vernalia	13,540 ^r	*1922-	USGS	12/9/50	32.81	79,000 ^c	1/12/65	28.27	22,800 ^c
Gatos Creek e Nunez Canyon Coalinga	95.8 ^r	1949-	USGS	4/3/58 2/9/62	6.51 7.25	2,560 2,560	1/6/65	4.39	119
s River w North	1,342	1951-	USGS	12/23/55	23.08	85,200	12/22/64	11.12	15,800
eah River at ee Rivers	418	1958-	USGS DWR	2/1/63	13.68	30,900	12/23/64	8.45	6,050
e River near ingville	225	1957-	USGS	1/31/63	10.80	10,100	12/27/64	7.27	3,330
e River below cess Dam	393	1953-	USGS	12/23/55	21.65 ^b	27,000	12/23/64	7.29	1,200 ^c
n River at nville	1,000 ^r	1905-12 1953-	USGS	12/23/55	16.8 ^h	29,400	1/27/65	10.37	6,840

Table 21 (Continued)

Stream and Station	Drainage Area in Sq. Mi.	Period of Record	Source of Record (a)	Previous Maximum of Record			December 1964-January 1965		
				Date	Stage in ft.	Dischg. in cfs	Date	Stage in ft.	Dischg. in cfs
Northern Lahontan Area									
Willow Creek near Susanville	92.5	1950-	USGS	2/1/63	5.59	816	12/23/64	5.43	744
Susan River at Susanville	192	*1900-	USGS	1/31/63	6.78	3,900	12/22/64	7.30	5,100**
Little Truckee River above Boca Reservoir near Boca	146	1903-10 1939-	USGS	2/1/63	9.00	13,300	12/23/64	6.95	10,500
Truckee River at Parad	932	1899-	USGS	11/21/50	14.5 ^h	17,500	12/23/64	11.67	12,000 ^c
East Fork Carson River below Markleeville Creek near Markleeville	276 ^r	1960-	USGS	1/31/63	8.21	15,100	12/23/64	7.20	9,360
West Fork Carson River at Woodfords	65.6	*1900-	USGS	2/1/63	9.00	4,890	12/23/64	6.70	3,040
West Walker River below Little Walker River near Coleville	180 ^r	1938-	USGS	11/20/50	8.10	6,220	12/23/64	5.76	2,950
East Walker River near Bridgeport	359 ^r	1921-	USGS	6/19/63	4.64	1,390	12/22/64	0.17	7.8 ^c

LEGEND

- (a) USWB - United States Weather Bureau
 USCE - United States Corps of Engineers
 USGS - United States Geological Survey
 USBR - United States Bureau of Reclamation
 DWR - Department of Water Resources
 PG&E - Pacific Gas and Electric Company
 b - Site and/or datum then in use
 c - Affected by storage and/or diversion
 d - Discharge over weir
 e - Estimated
 f - Includes flow through powerhouse
 g - Includes flow bypassing station
 h - From flood marks
 j - Crest stage gage
 k - Discharge not determined; affected by backwater
 m - Maximum observed
 n - From DWR telemetering log
 p - Due to failure of partially completed Hell-Hole Dam
 r - Revised
 * - Incomplete record
 ** - Maximum of record

Table 22

Reservoir Operations During Period
December 20, 1964 - January 20, 1965

Stream	Reservoir	Capacity Acre-Feet	Storage Dec. 20, 1964 Acre-Feet	Peak Storage in Acre-Feet and Date	Peak Inflow in CFS and Date	Peak Discharge in CFS and Date
Shasta River	Dwinnell	72,000	6,850	32,320** 1/20/65	6,050* 12/22/64	0
Trinity River	Clair Engle Lake	2,500,000	1,491,700	2,045,900** 1/20/65	74,787* 12/22/64	859* 1/1/65
Mad River	Ruth	51,800	52,600 ^s	76,900 12/22/64	N.A.	32,000 12/22/64
E. Fork Russian River	Lake Mendocino	122,500	74,060	129,250 12/24/64	21,000 12/22/64	6,350 12/25/64
Clear Creek	Whiskeytown	250,000	209,500	245,200* 12/23/64	12,340* 12/22/64	3,636 12/23/64 to 1/1/65
Sacramento River	Shasta	4,500,000	2,527,000	3,321,700 12/27/64	187,100 12/22/64	54,500 12/27/64
Stony Creek	East Park	51,000	14,550	50,520 1/6/65	4,800* 12/23/64	1,700* 1/6/65
	Stony Gorge	50,000	13,690	50,080* 12/23/64	18,750* 12/23/64	12,110* 12/24/64
	Black Butte	160,000	29,000	97,100 12/23/64	47,000 12/23/64	19,300 12/23/64
N. Fork Feather River	Lake Almanor	1,308,000	512,600	709,070** 1/20/65	11,750* 12/23/64	42 12/20/64 to 1/20/65
Little Lost Chance Creek	Frenchman	55,400	31,680	41,600** 1/20/65	345* 12/26/64	2* 12/20/64 to 1/20/65
Indian Creek	Antelope	22,500	3,120	21,300** 1/20/65	1,930* 12/23/64	18* 12/22/64
Butte Creek	Butte Valley	49,800	41,280	47,450 12/23/64	3,800 12/23/64	N.A.
Bucks Creek	Bucks Lake	103,000	41,420	82,240 1/15/65	7,800 12/23/64	0
S. Fork Feather River	Little Grass Valley	93,000	53,700	74,700 1/10/65	503 12/23/64	400 1/10/65
Lost Creek	Sly Creek	65,000	32,900	56,200 12/27/64	533 12/22/64	1,550 12/27/64
Canyon Creek	Bowman	68,000	33,500	68,850* 12/26/64	9,580* 12/22/64	2,070* 12/25/64
S. Fork Yuba River	Spaulding	74,500	49,770	75,500 12/23/64	26,000 12/23/64	25,500 12/23/64
N. Fork Yuba River	Bullards Bar	31,500	32,430 ^s	41,940 12/22/64	N.A.	91,600 12/22/64
Yuba River	Englebright	70,000	71,100 ^s	85,600 12/22/64	175,200 12/22/64	171,700 12/22/64
Deer Creek	Scotts Flat	49,000	4,810	43,000*** 1/20/65	3,200 12/23/64	0
Cache Creek	Clear Lake	420,000	65,800	426,900 1/8/65	43,000 12/22/64	9,400 1/5/65
Gerle Creek	Leon Lake	76,500	8,800	37,500** 1/20/65	4,240 12/22/64	156 12/21/64
S. Fork Silver Creek	Ice House	46,000	11,800	37,300 1/14/65	3,840 12/23/64	111 1/16/65
Silver Creek	Union Valley	271,000	138,800	229,200 12/27/64	26,740 12/23/64	1,500 12/27/64

Table 22 (Continued)

Stream	Reservoir	Capacity Acre-Feet	Storage Dec. 20, 1964 Acre-Feet	Peak Storage in Acre-Feet and Date	Peak Inflow in CFS and Date	Peak Discharge in CFS and Date
American River	Folsom	1,000,000	577,000	899,000 12/23/64	280,000 12/23/64	115,000 12/23/64 to 12/25/64
Putah Creek	Lake Berryessa	1,600,000	1,355,000	1,686,900 1/7/65	79,100 1/5/65	7,300 1/7/65
Sly Park Creek	Jenkinson Lake	41,000	29,600	41,570* 1/6/65	1,290* 12/23/64	415* 1/7/65
Bear River	Lower Bear River	48,500	30,280	51,430 12/24/64	10,000 ^e 12/23/64	N.A.
N. Fork Mokelumne River	Salt Springs	139,400	6,222	81,800* 1/1/65	N.A.	N.A.
Mokelumne River	Pardee	210,000	201,200	220,600 12/24/64	32,100 12/24/64	28,400 12/24/64
	Camanche	431,500	54,700	266,700** 1/20/65	29,200 12/24/64	3,000 12/30/64
Calaveras River	New Hogan	325,000	16,600	166,000 1/20/65	20,600 12/23/64	1,480 1/9,10/65
Littlejohn Creek	Farmington	52,000	0	15,500 12/25/64	18,100 12/23/64	2,215 12/25/64
M. Fork Stanislaus River	Donnell	64,500	25,700	58,840 12/24/64	12,920 12/23/64	7,610 12/24/64
	Beardsley	97,500	36,770	29,620 12/27/64	12,280 12/24/64	2,845 12/27/64
Stanislaus River	Melones	112,600	42,600	115,600 12/24/64	48,700 12/23/64	33,230 12/24/64
	Tulloch	68,400	54,340	69,665 12/24/64	40,820 12/24/64	40,820 12/24/64
Tuolumne River	Hetch Hetchy	360,000	139,000	267,800 1/16/65	19,750* 12/24/64	1,810* 1/20/65
Cherry Creek	Cherry Valley	268,000	11,020	119,900** 1/20/65	11,670* 12/24/64	665* 1/5/65
Eleanor Creek	Lake Eleanor	27,800	1,920*	28,765 12/24/64	12,700 ^e 12/23/64	6,920 12/24/64
Tuolumne River	Don Pedro	289,000	87,000	205,200 12/28/64	44,000 12/23/64	8,450 1/6/65
Merced River	Lake McClure	289,000	15,000 ^e	266,400 1/7/65	41,400 12/23/64	16,750 1/7/65
Burns Creek	Burns	6,800	0	2,200 1/7/65	6,070 1/7/65	1,670 1/7/65
Bear Creek	Bear	7,700	0	2,340 1/7/65	6,940 1/7/65	1,340 1/7/65
Owens Creek	Owens	3,600	0	630 1/7/65	930 1/7/65	120 1/7/65
Mariposa Creek	Mariposa	15,000	200	4,250 1/7/65	3,650 1/7/65	820 1/8/65
S. Fork San Joaquin R.	Lake Florence	64,400	906	9,100 12/29/64	1,545 12/23/64	680 1/6/65
Mono Creek	Lake T. A. Edison	125,000	43,100	48,700 1/8/65	871 12/23/64	428 1/16/65
San Joaquin River	Mammoth Pool	123,000	21,700	86,300 12/28/64	14,700 12/23/64	2,050 12/29/64

Table 22 (Continued)

Stream	Reservoir	Capacity Acre-Feet	Storage Dec. 20, 1964 Acre-Feet	Peak Storage in Acre-Feet and Date	Peak Inflow in CFS and Date	Peak Discharge in CFS and Date
Big Creek	Huntington Lake	88,800	6,300	37,150** 1/20/65	952 12/24/64	569 1/10/65
Stevenson Creek	Shaver Lake	135,300	27,500	37,000 1/14/65	870 12/24/64	625 1/15/65
San Joaquin River	Redinger Lake	35,000	25,400	25,600 1/4/65	1,114 1/6/65	3,300 1/5/65
	Millerton Lake	520,500	226,000	438,900** 1/20/65	6,480* 12/24/64	67 12/21/64
Helms Creek	Courtwright	123,300	59,780	65,860** 1/20/65	1,100 12/23/64	24 12/23/64
N. Fork Kings River	Wishon	128,000	14,900	27,920 1/4/65	4,100 12/23/64	7 12/20/64 to 1/20/65
Kings River	Pine Flat	1,000,000	281,000	479,800** 1/20/65	12,344* 12/24/64	698* 1/20/65
Kaweah River	Terminus	150,000	8,100	14,000 12/24/64	3,915* 12/24/64	2,412* 12/25/64
Tule River	Success	80,000	10,000	14,900 12/28/64	2,000* 12/27/64	840* 12/30/64
Kern River	Isabella	570,000	94,600	125,000** 1/20/65	4,359* 12/27/64	556* 12/24/64
Prosser Creek	Prosser Creek	30,000	5,730	26,680 12/24/64	6,994* 12/23/64	1,851* 12/25/64
Little Truckee River	Boca	41,200	7,000	30,070 12/25/64	4,356* 12/25/64	1,950* 12/25/64

LEGEND

s - Spilling

e - Estimated

N.A. - Not Available

* - Mean daily values

** - Reservoir storage increasing on 1/20/65. Peak storage occurred at later date.

P L A T E S

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DEPARTMENT OF WATER RESOURCES
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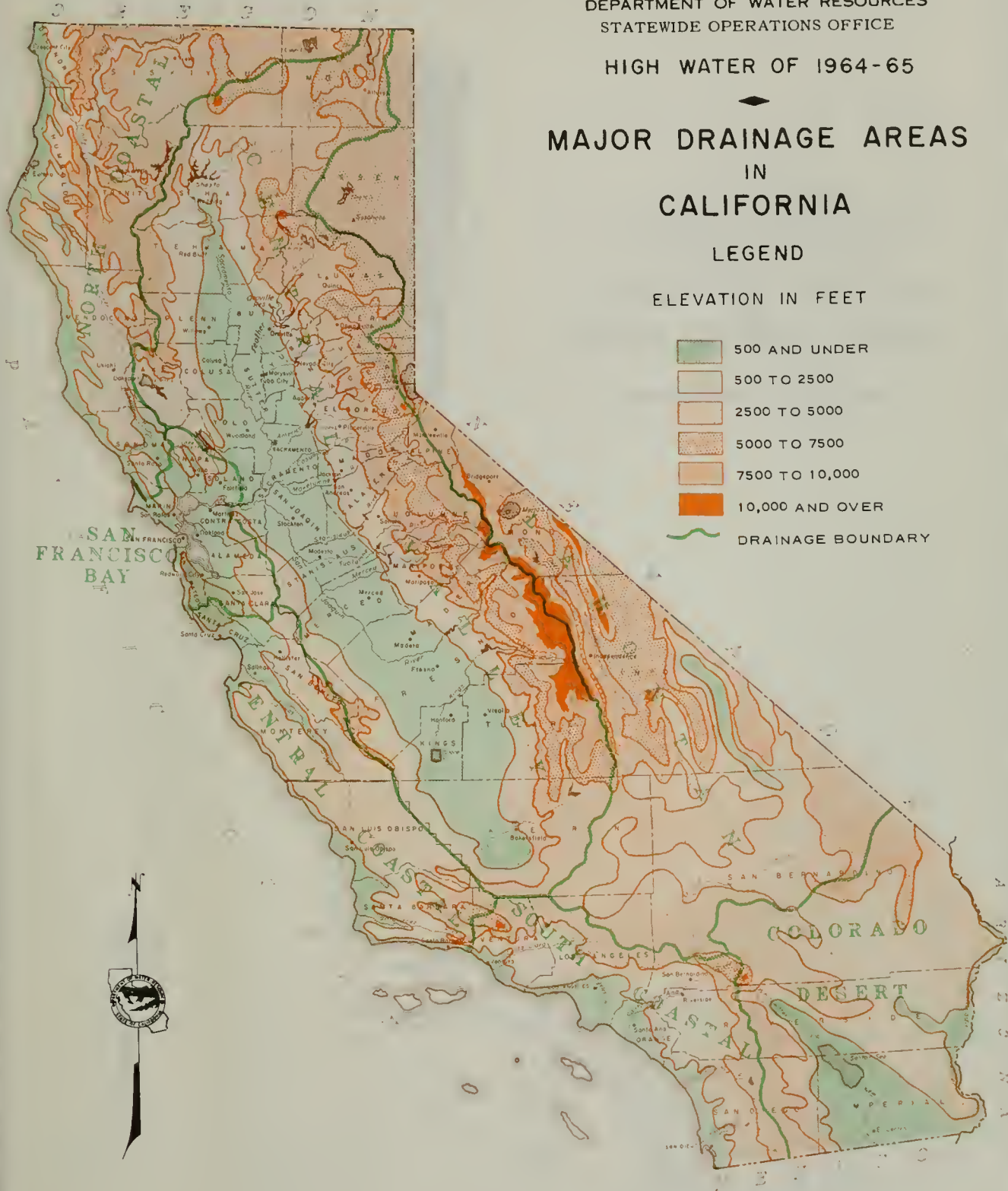
HIGH WATER OF 1964-65

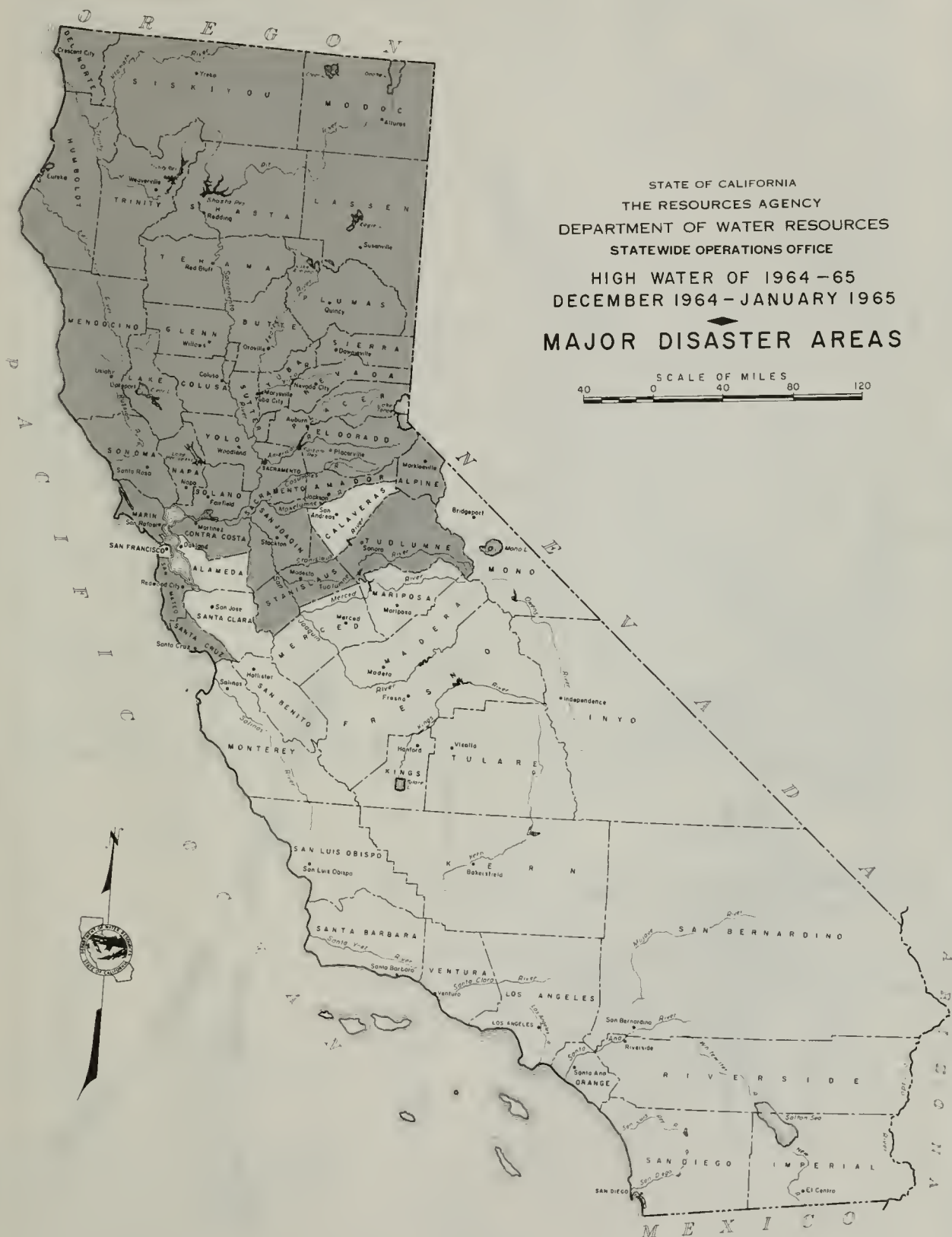
MAJOR DRAINAGE AREAS
IN
CALIFORNIA

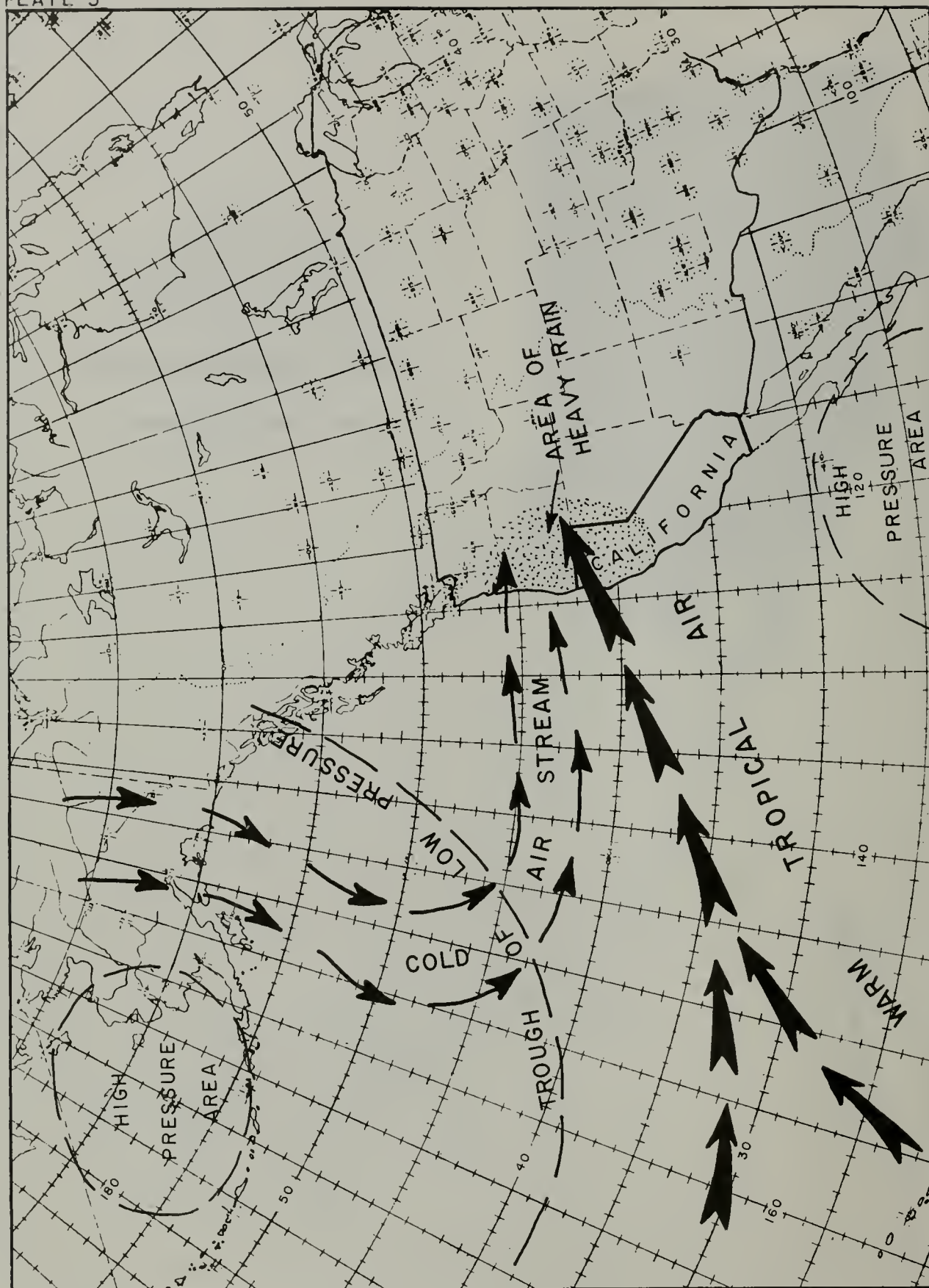
LEGEND

ELEVATION IN FEET

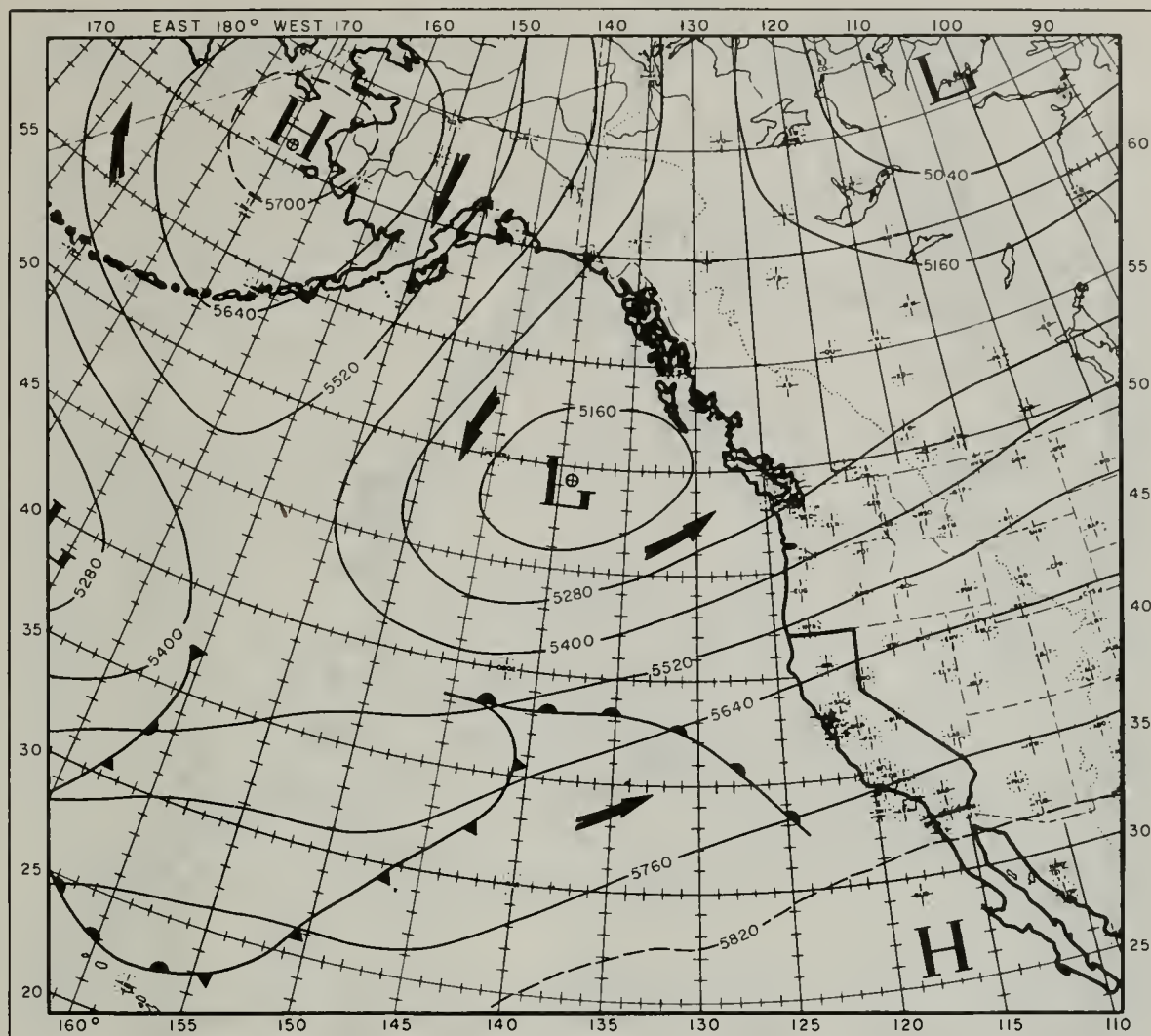
- 500 AND UNDER
- 500 TO 2500
- 2500 TO 5000
- 5000 TO 7500
- 7500 TO 10,000
- 10,000 AND OVER
- DRAINAGE BOUNDARY







1600 PST 12/20/64

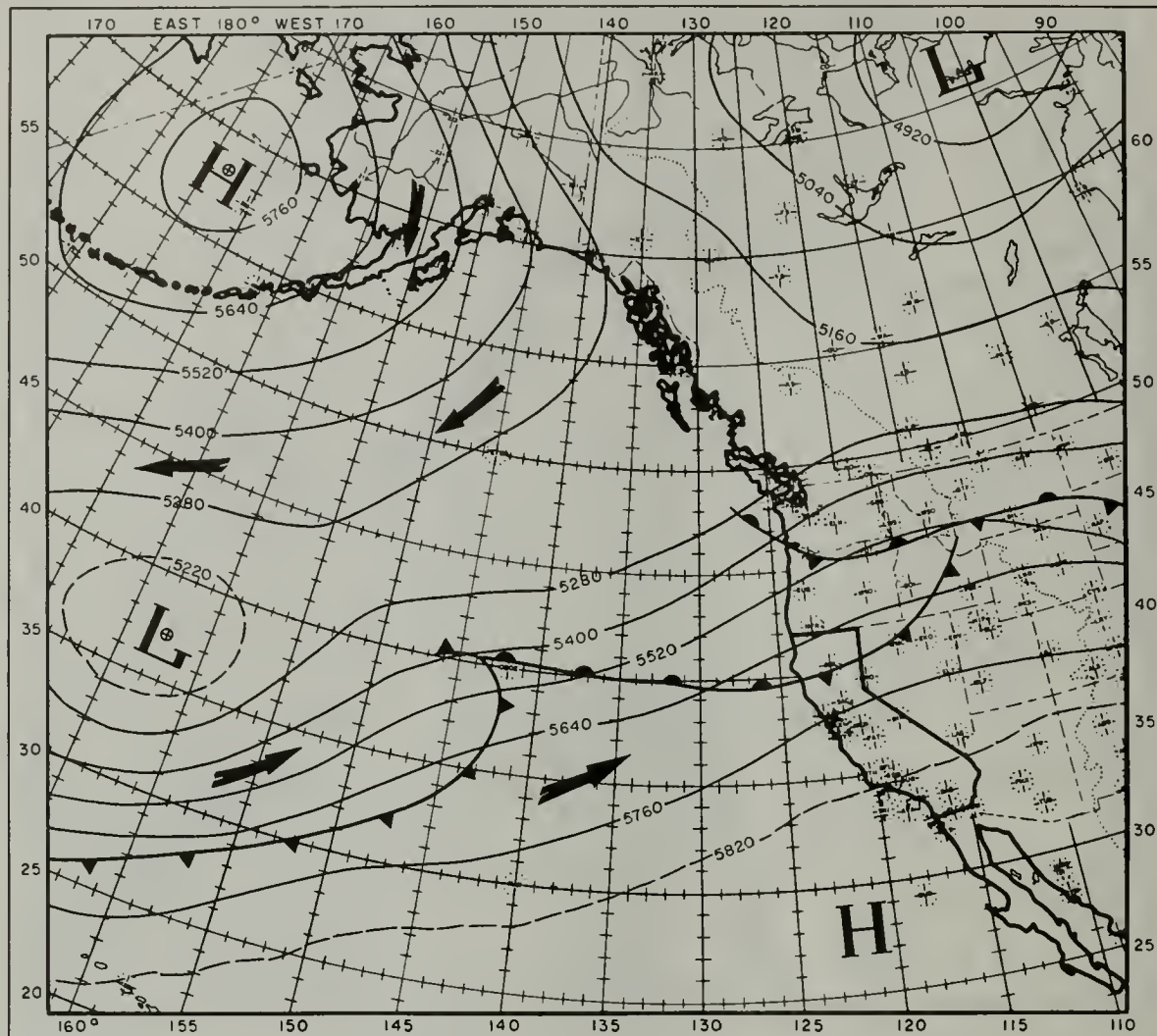
LEGEND

- 5640 — Contour of the 500-millibar surface; elevation in meters.
- ⌒⌒⌒⌒⌒ Occluded front
- ▼▼▼▼ Cold front
- ⌒⌒⌒⌒ Warm front
- ▼⌒⌒⌒ Stationary front
- ➔ Direction of air flow

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500-MILLIBAR CHART
DECEMBER 20, 1964
with superimposed fronts
from the
surface weather map

1600 PST 12/21/64



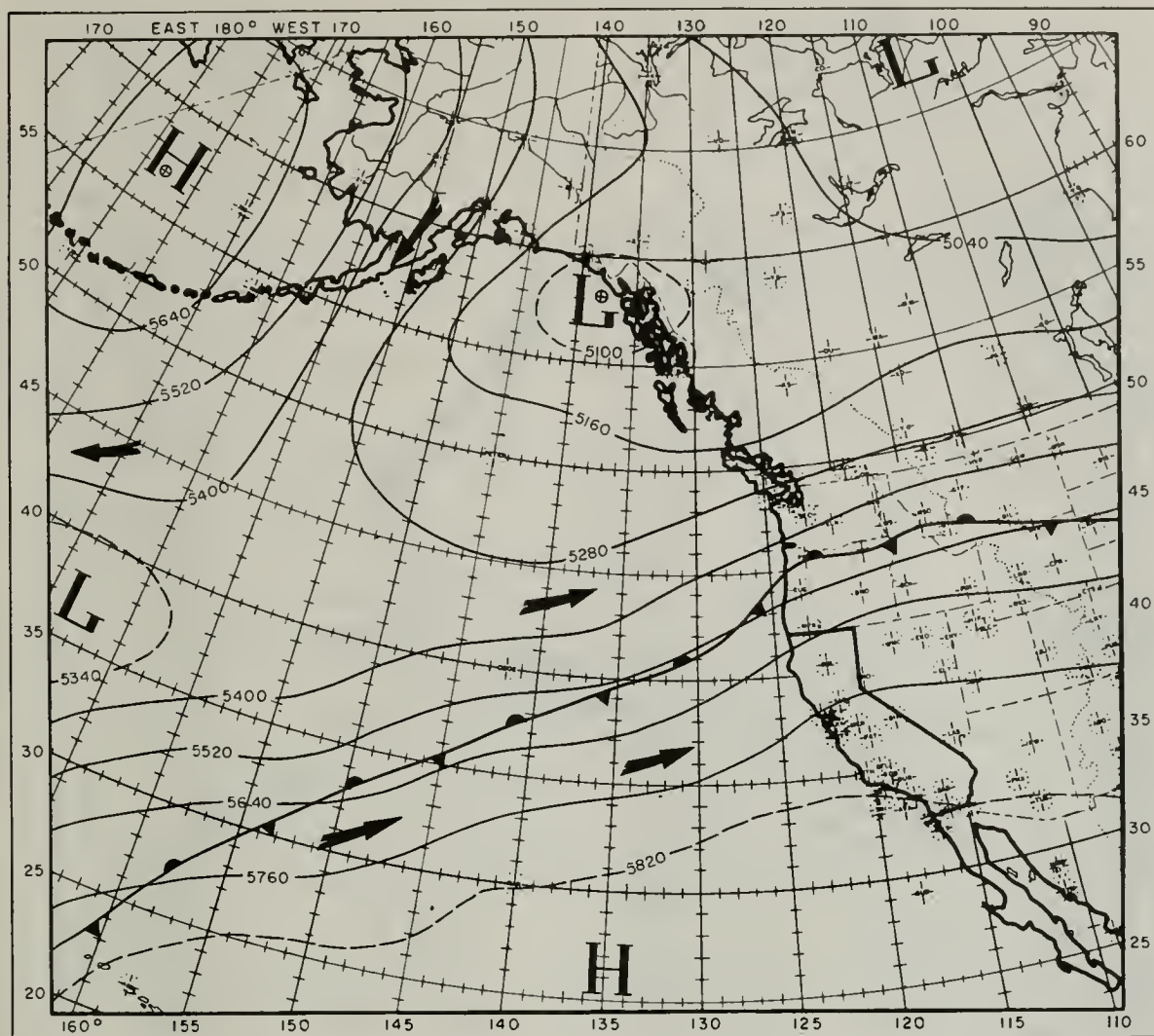
LEGEND






- 5640 — Contour of the 500-millibar surface; elevation in meters.
- ▲— Occluded front
- ▲— Cold front
- Warm front
- ▲— Stationary front
- Direction of air flow

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500-MILLIBAR CHART
DECEMBER 21, 1964
with superimposed fronts
from the
surface weather map

1600 PST 12/22/64

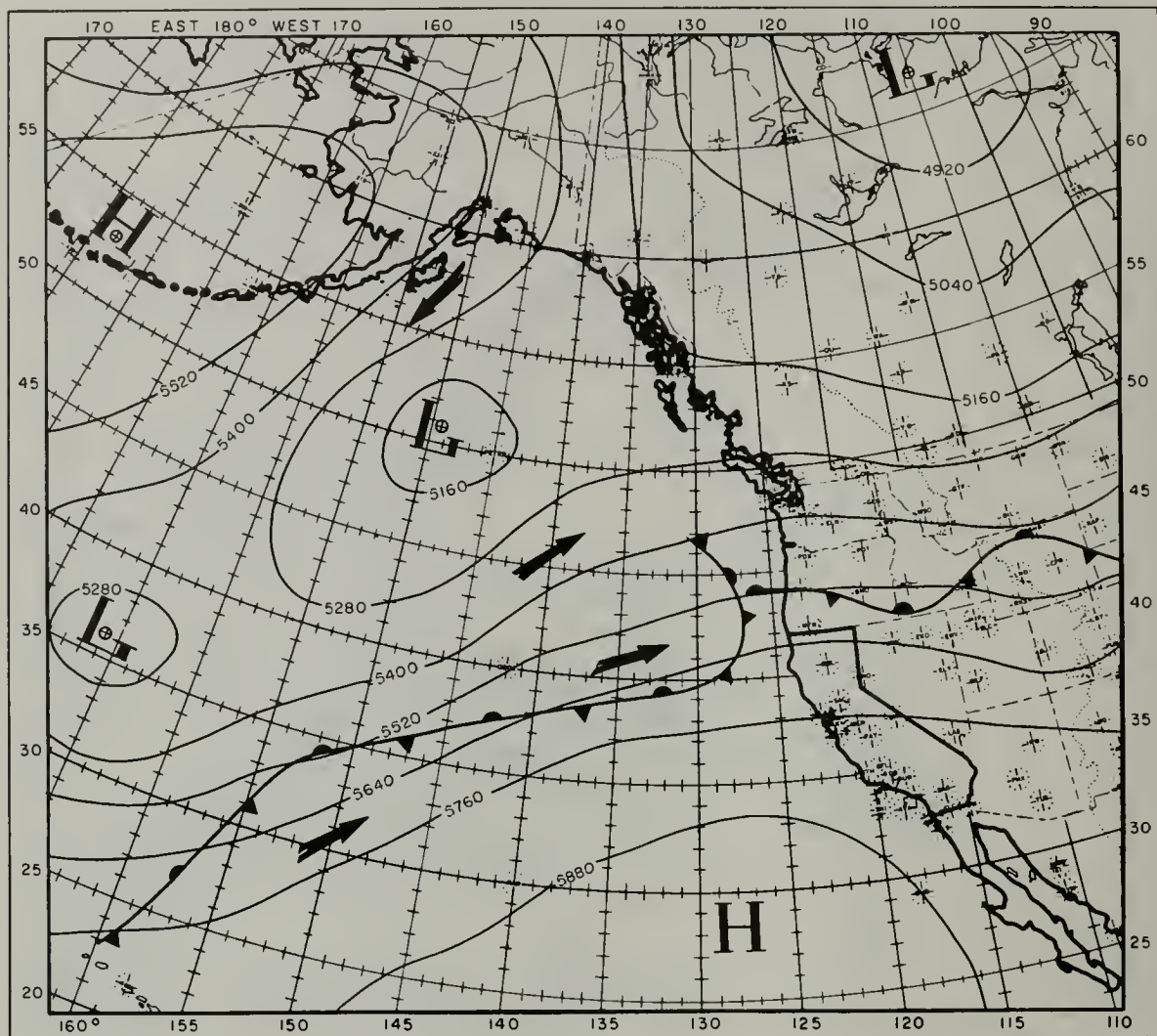
LEGEND

- 5640 — Contour of the 500-millibar surface; elevation in meters.
-  Occluded front
-  Cold front
-  Warm front
-  Stationary front
-  Direction of air flow





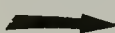
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500-MILLIBAR CHART
DECEMBER 22, 1964
with superimposed fronts
from the
surface weather map

1600 PST 12/23/64

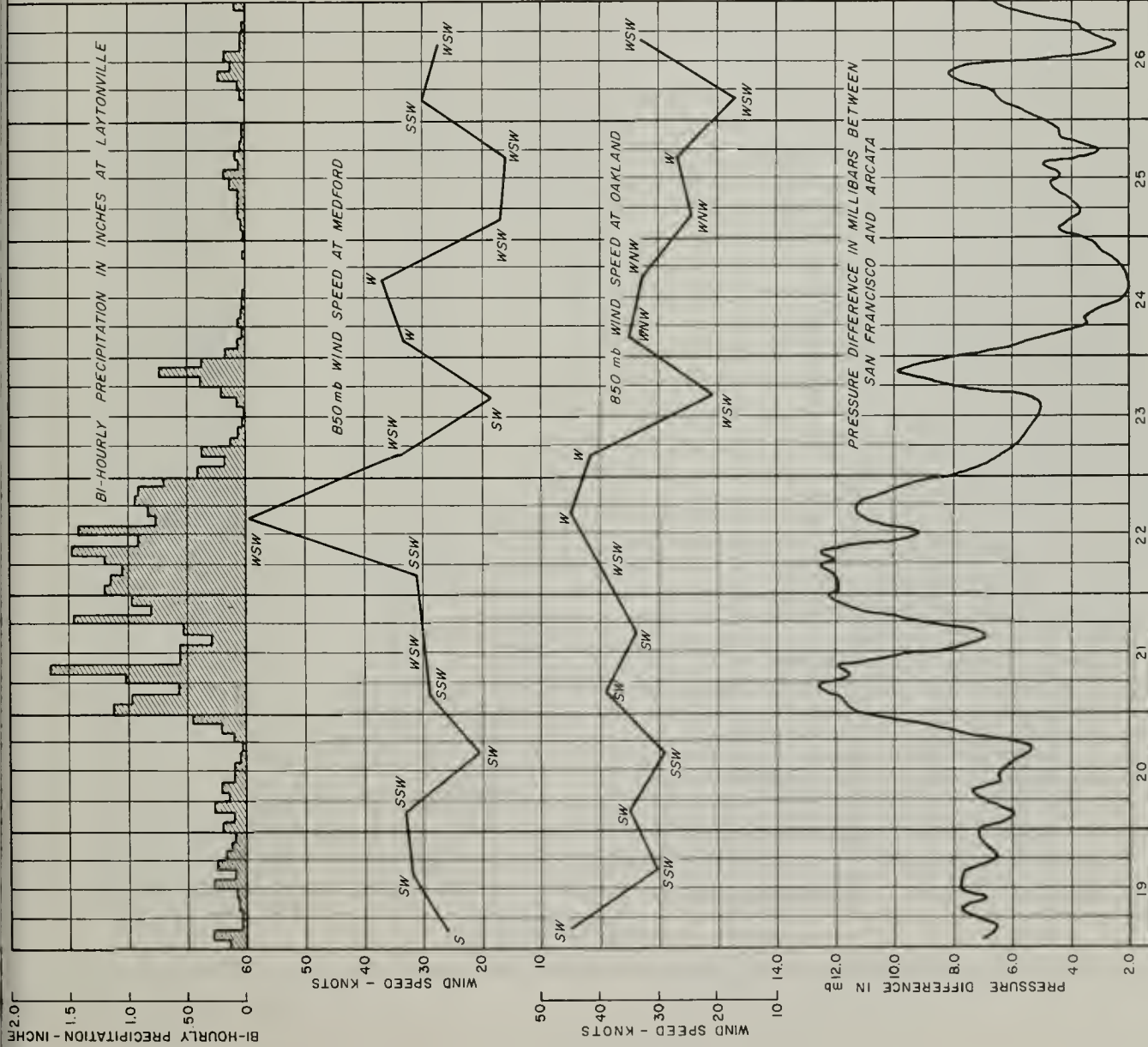


LEGEND

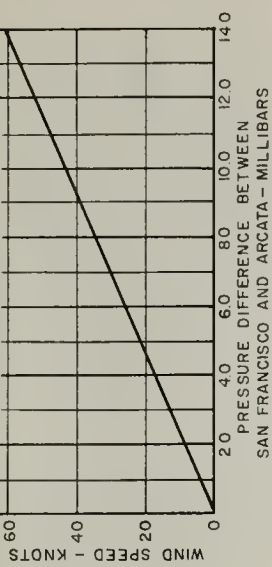
- 5640— Contour of the 500-millibar surface; elevation in meters.
-  Occluded front
-  Cold front
-  Warm front
-  Stationary front
-  Direction of air flow

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500-MILLIBAR CHART
DECEMBER 23, 1964
with superimposed fronts
from the
surface weather map



GEOSTROPHIC WIND SCALE



NOTES

SSW  Indicates the direction from which the wind was blowing
The 850 mb pressure is at an elevation of about 5000 feet
1 knot = 1.15 miles per hour

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STATEWIDE OPERATIONS OFFICE
HIGH WATER OF 1964-65
DECEMBER 1964 STORM

METEOROLOGICAL DATA
PRESSURE GRADIENT AND WIND
DECEMBER 19-26, 1964

AIR TEMPERATURE AT SEXTON SUMMIT
ELEVATION 3841 FEET

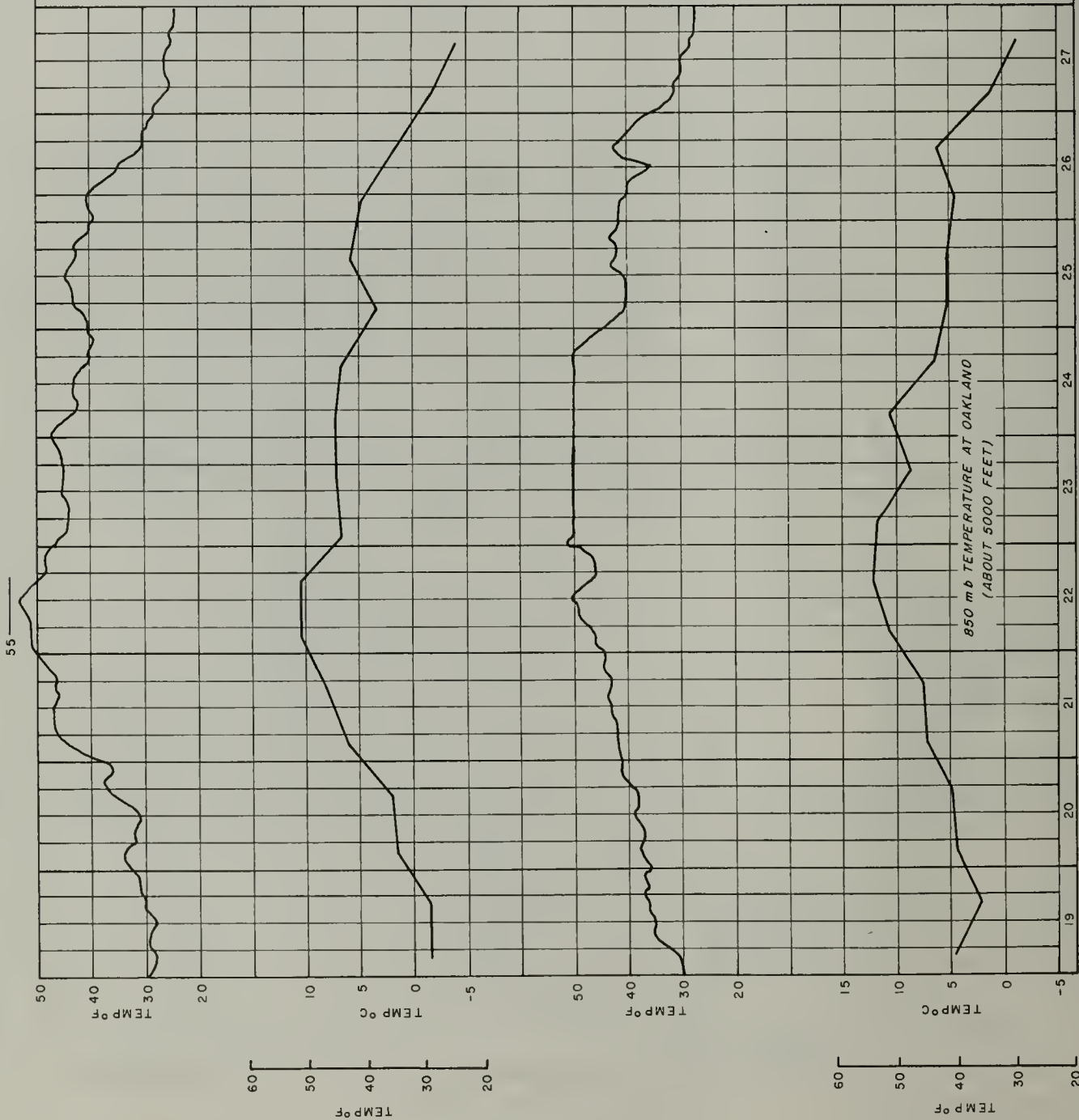
850 mb TEMPERATURE AT MEOFORO
(ABOUT 5000 FEET)

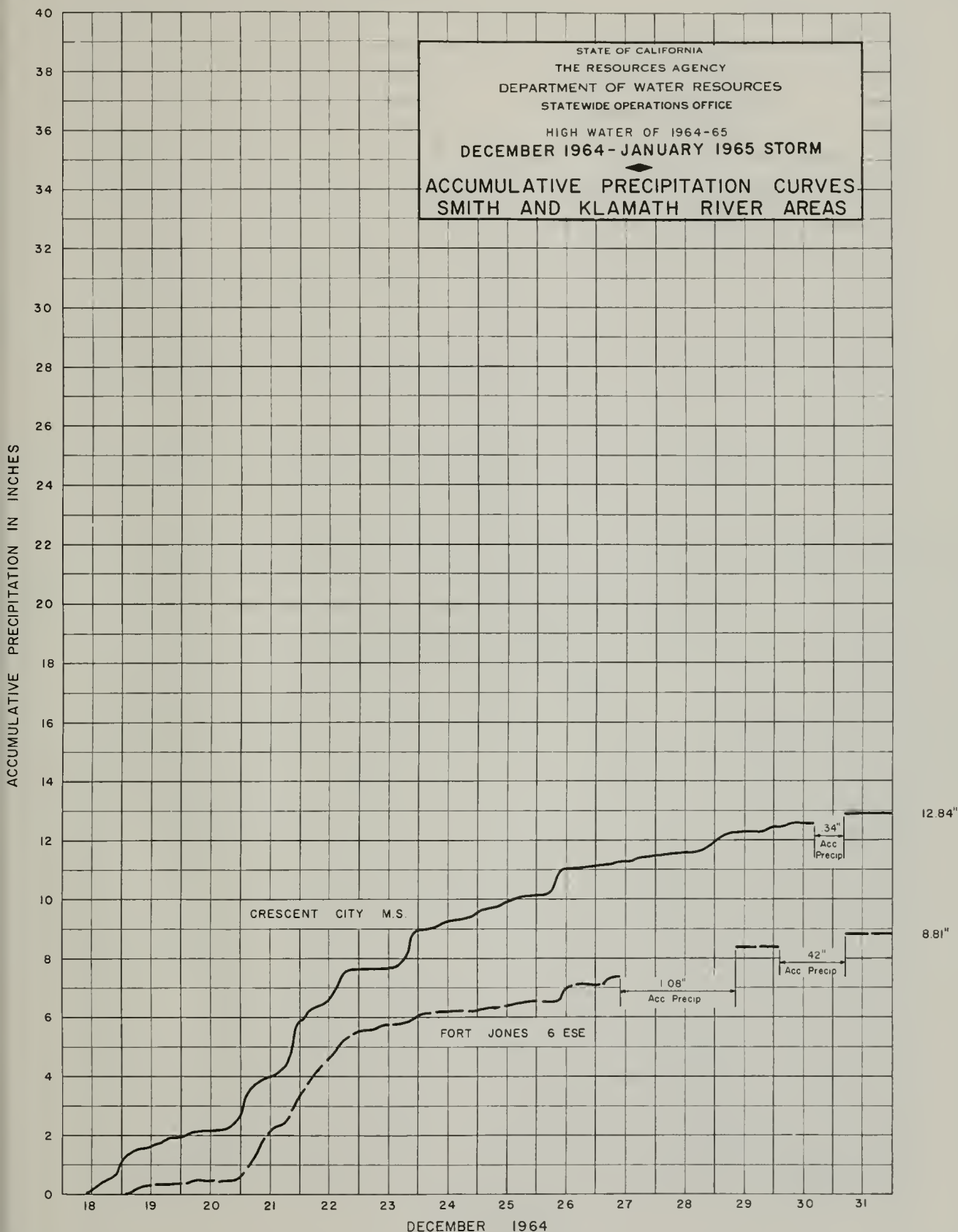
AIR TEMPERATURE AT BLUE CANYON
ELEVATION 5280 FEET

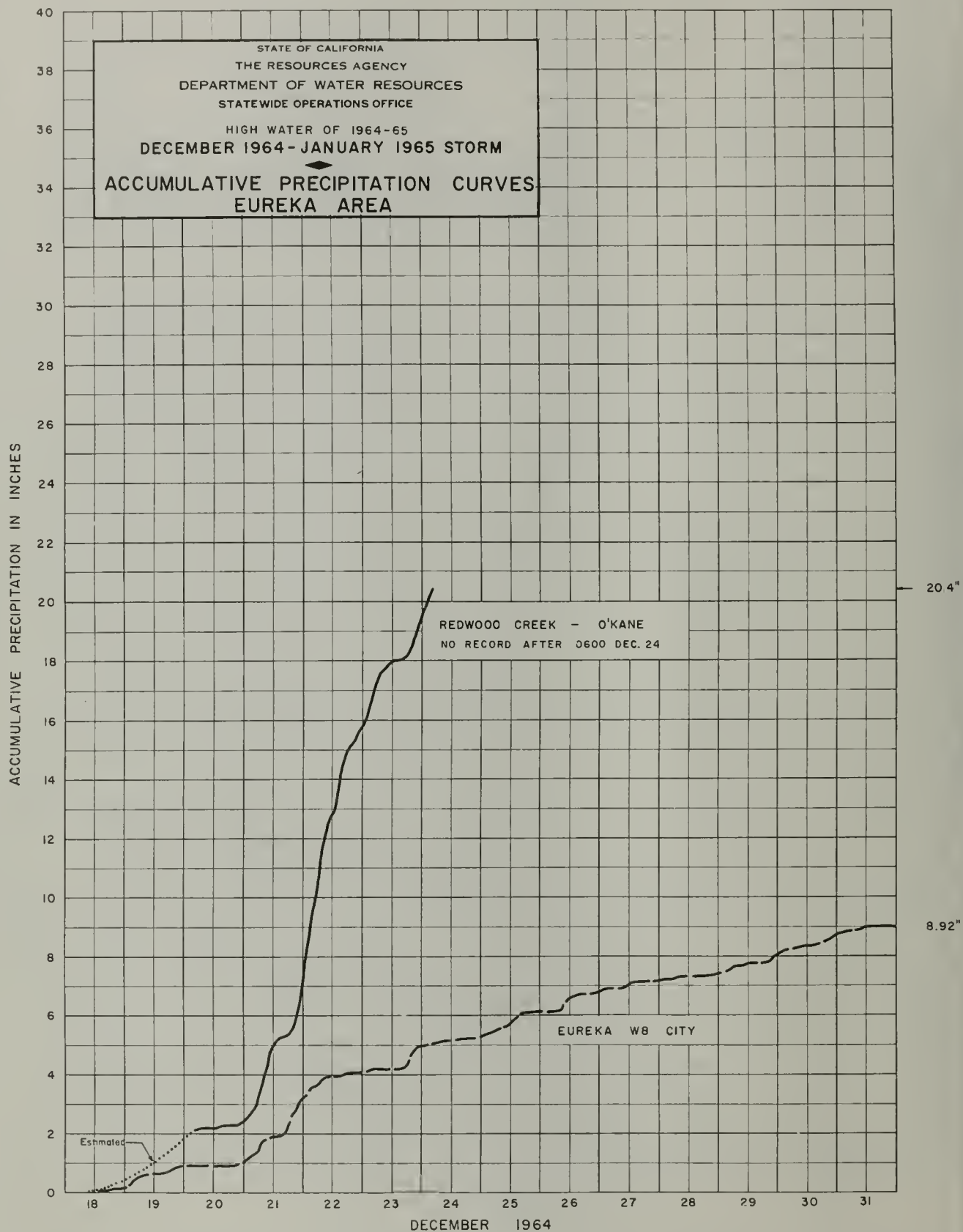
STATE OF CALIFORNIA
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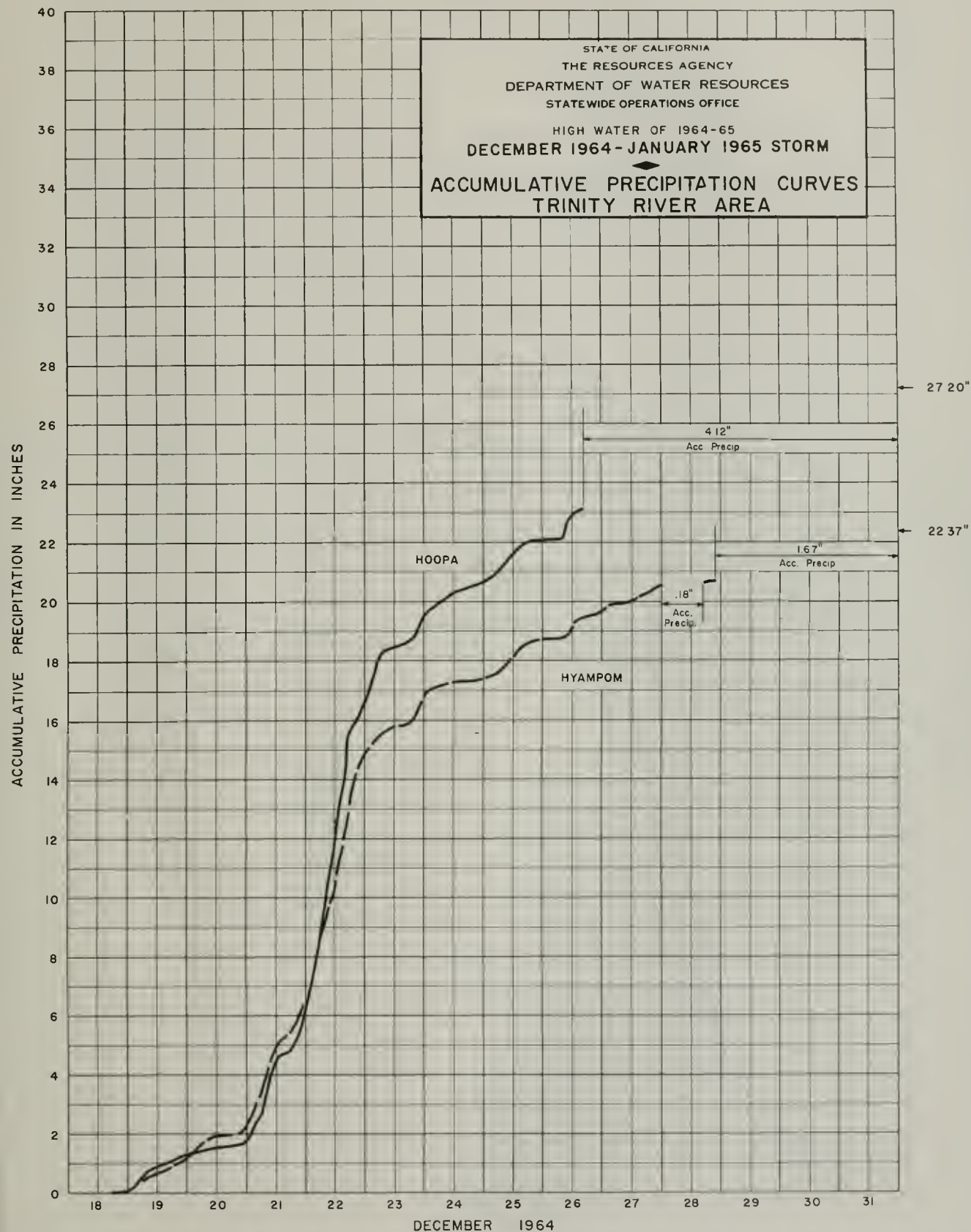
HIGH WATER OF 1964-65
DECEMBER 1964 STORM

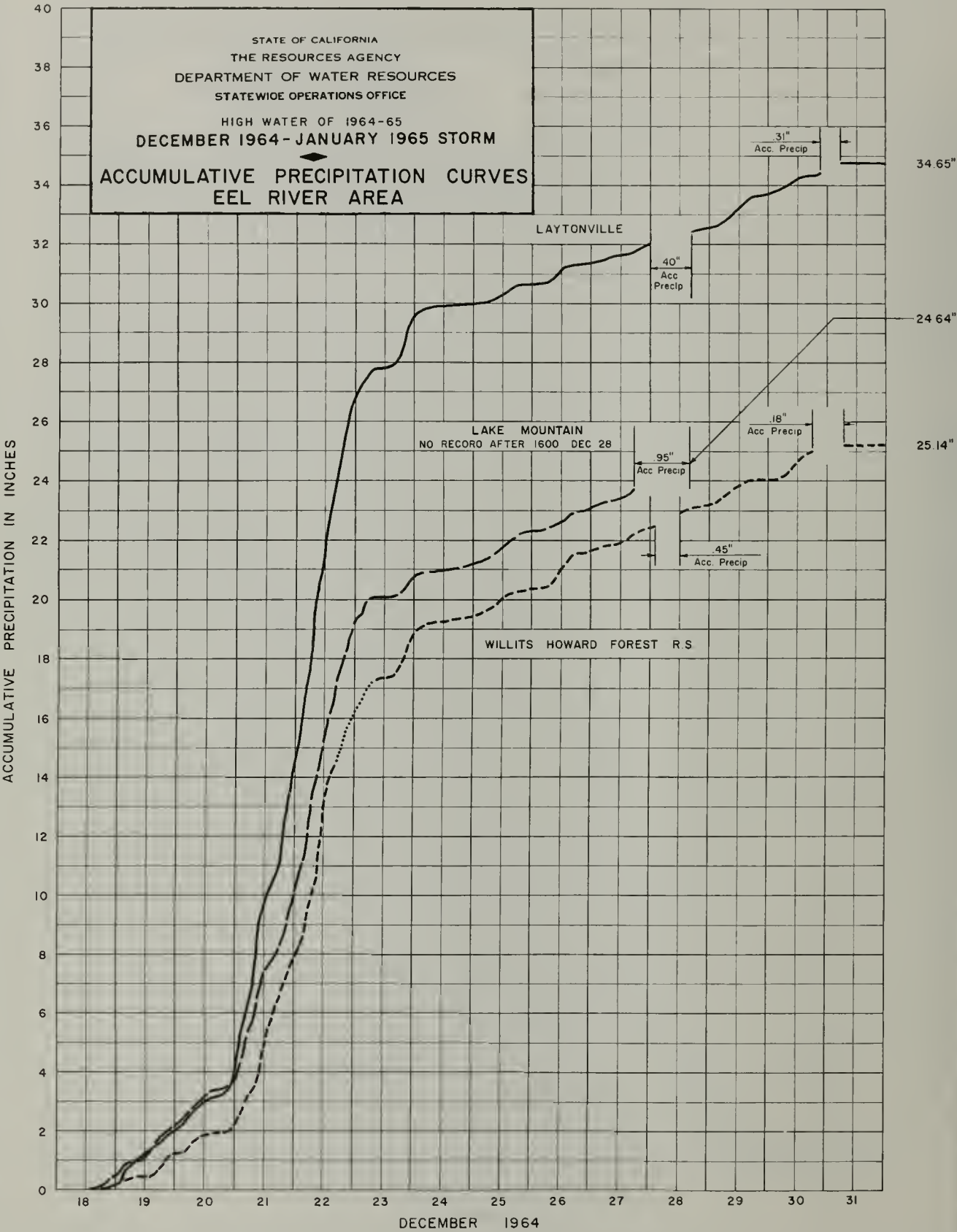
METEOROLOGICAL DATA
TEMPERATURE
DECEMBER 19-27, 1964

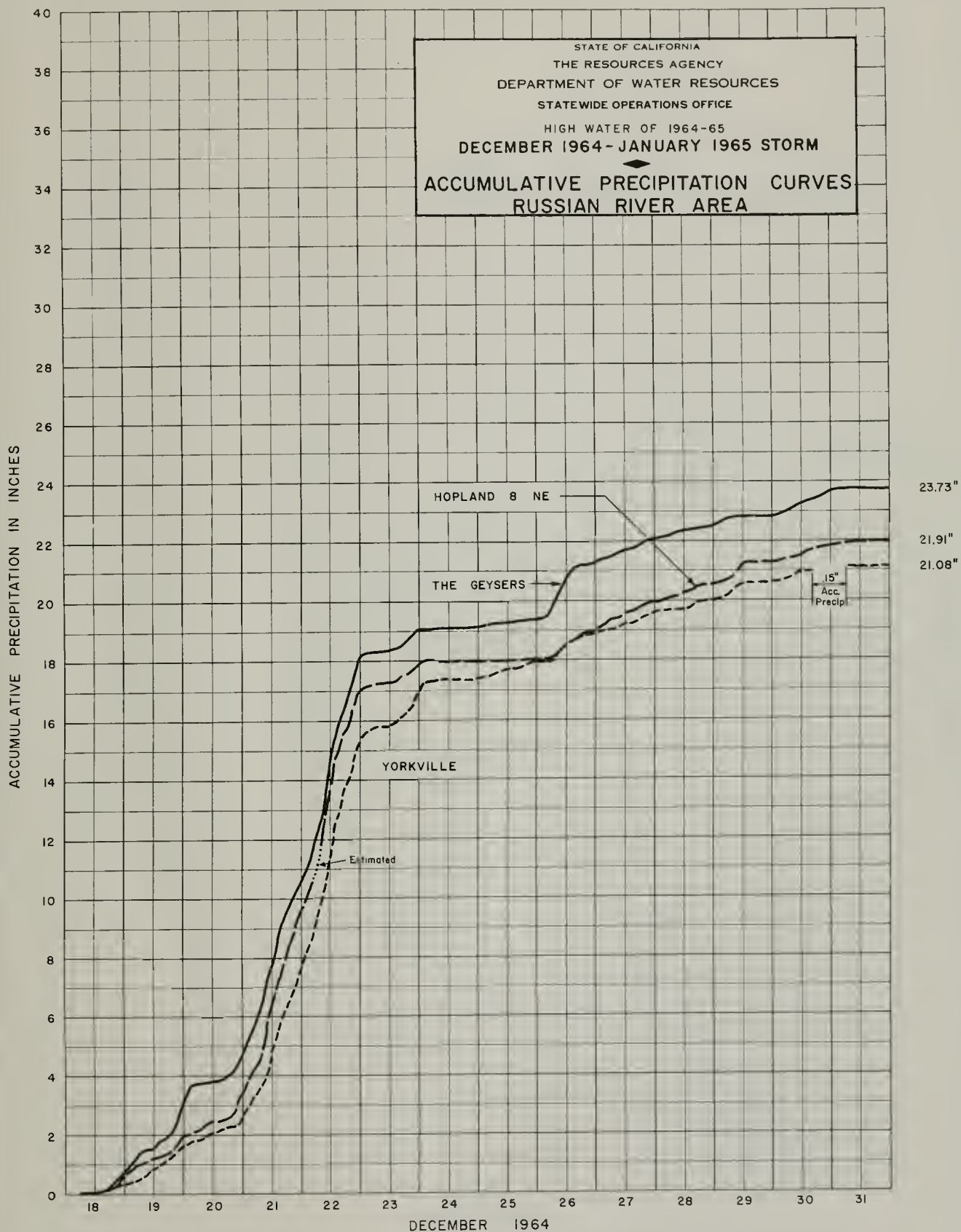


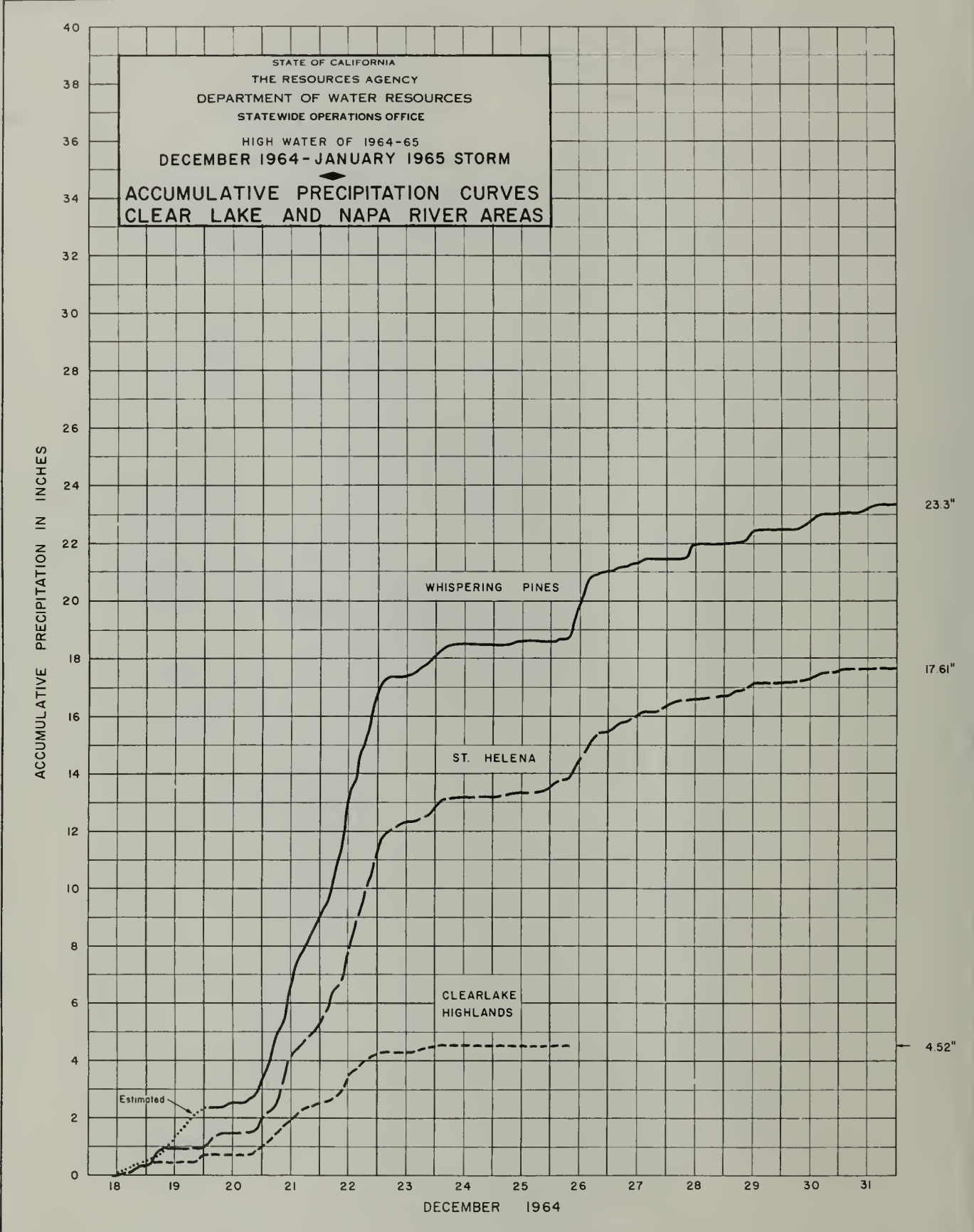


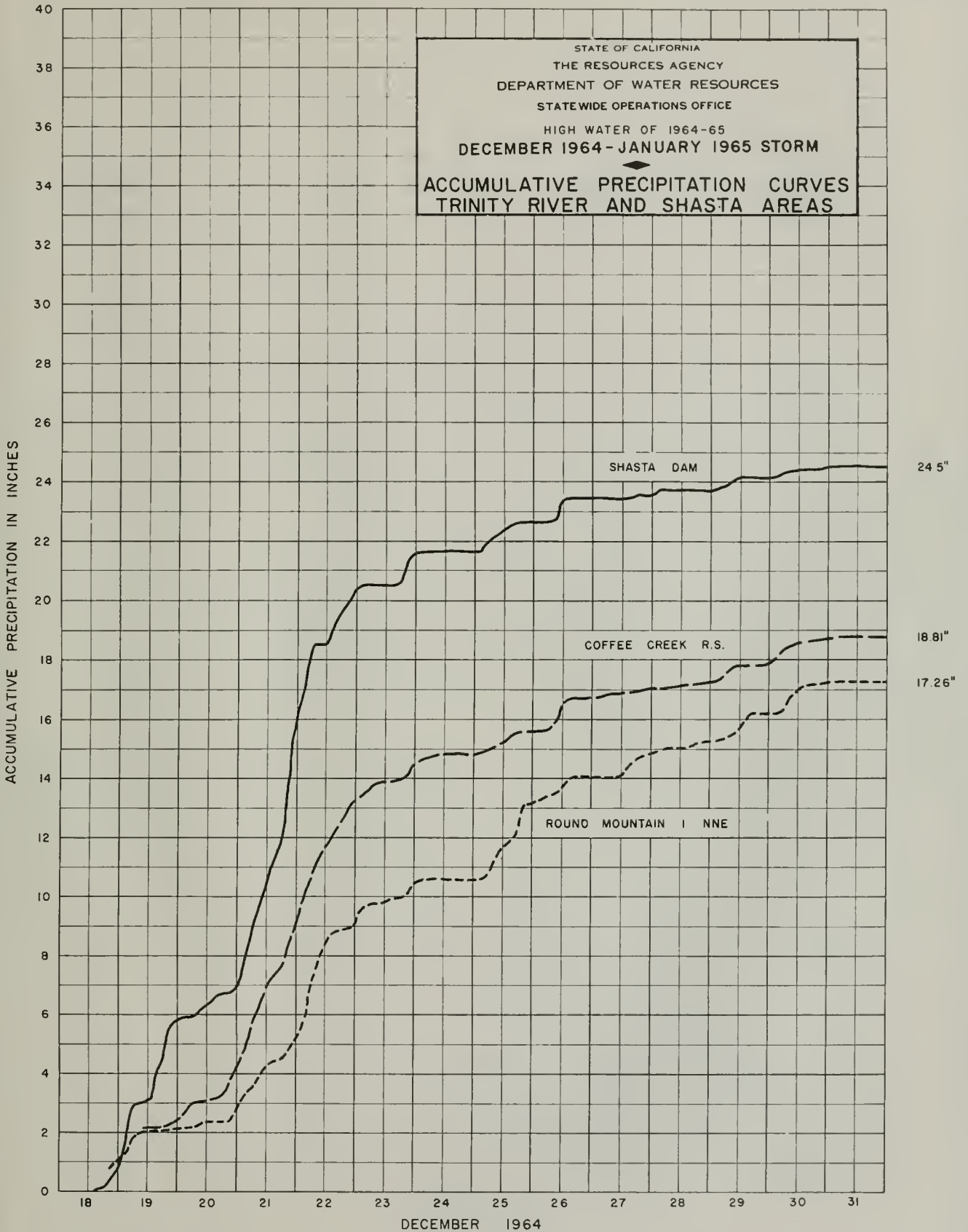


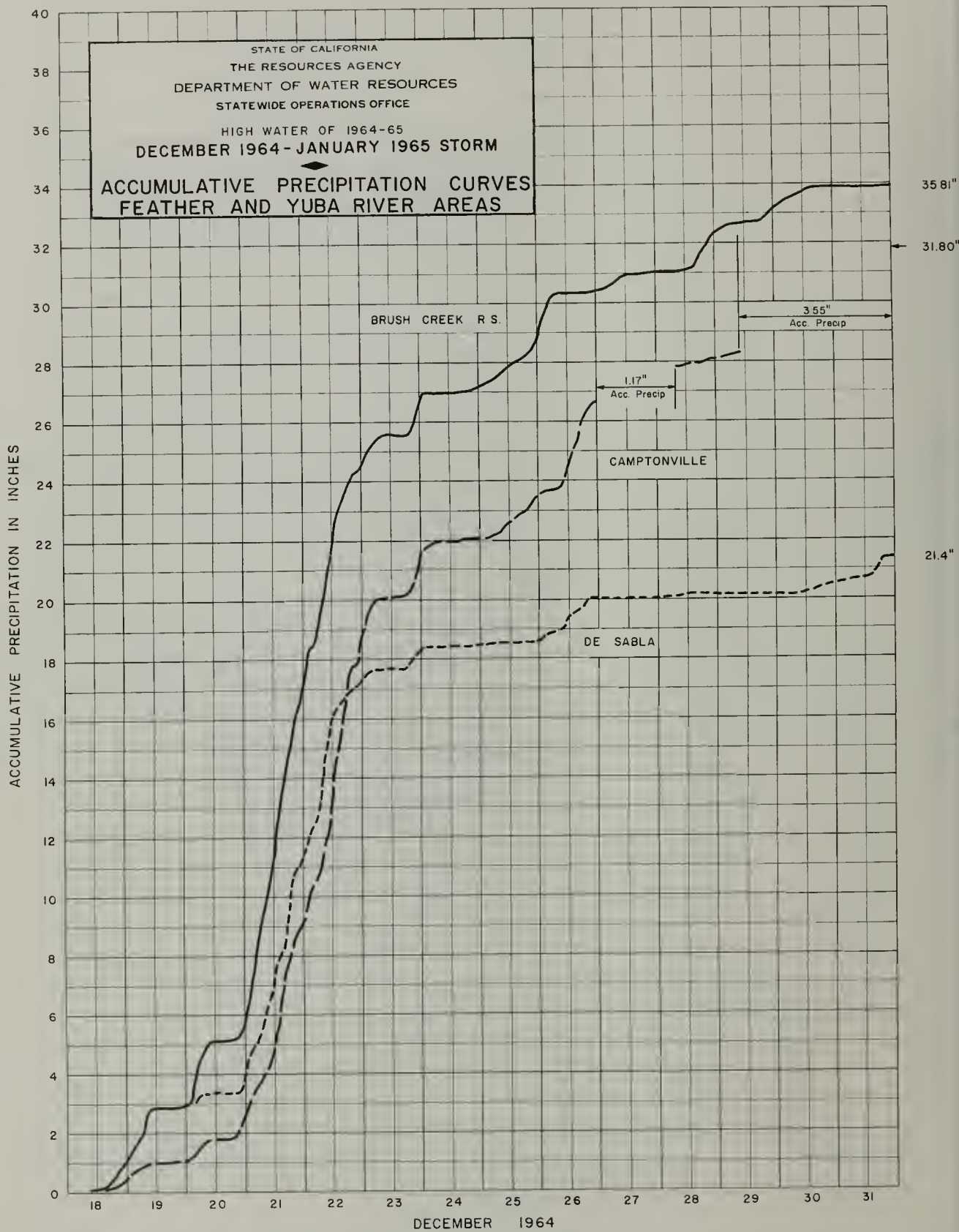


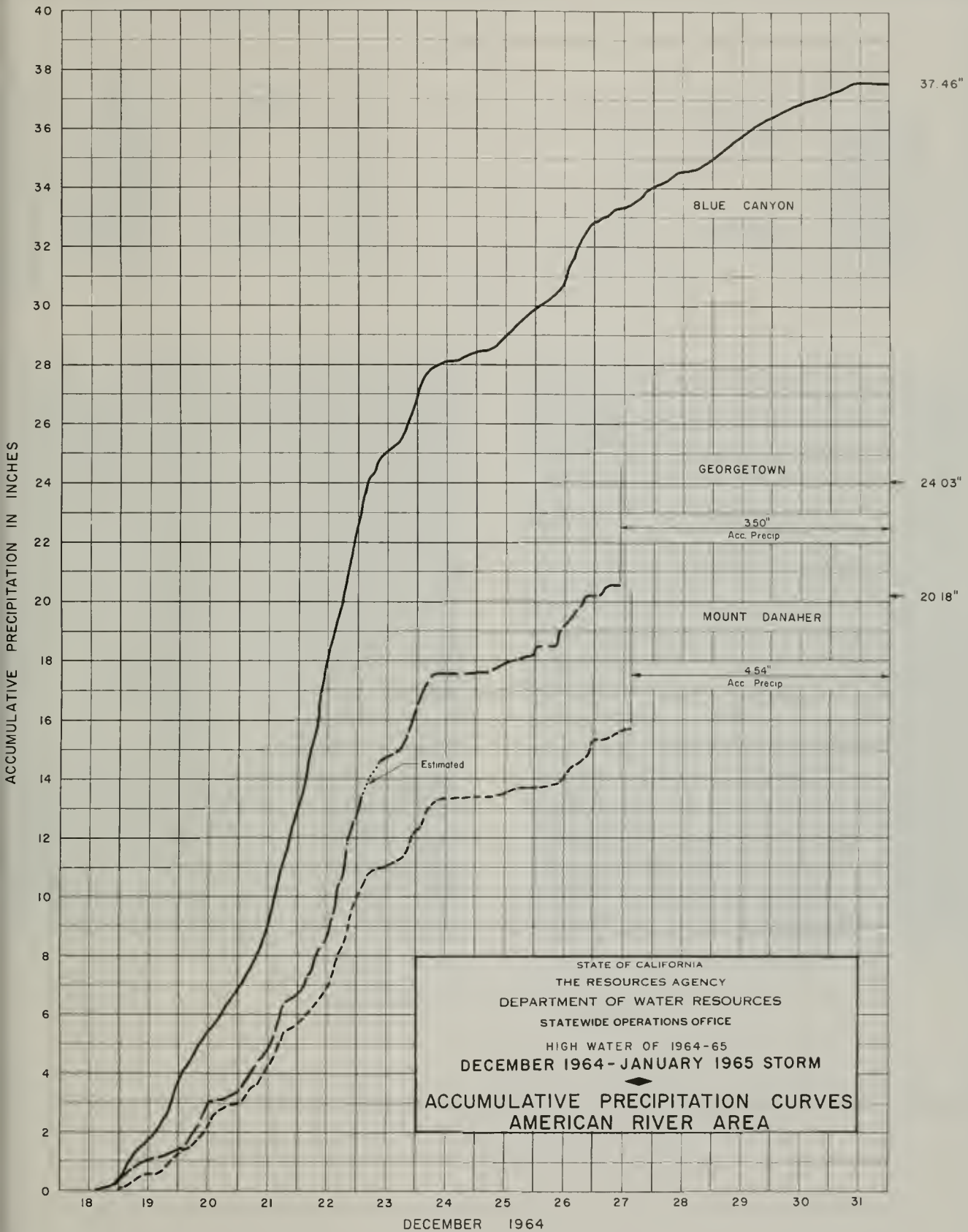






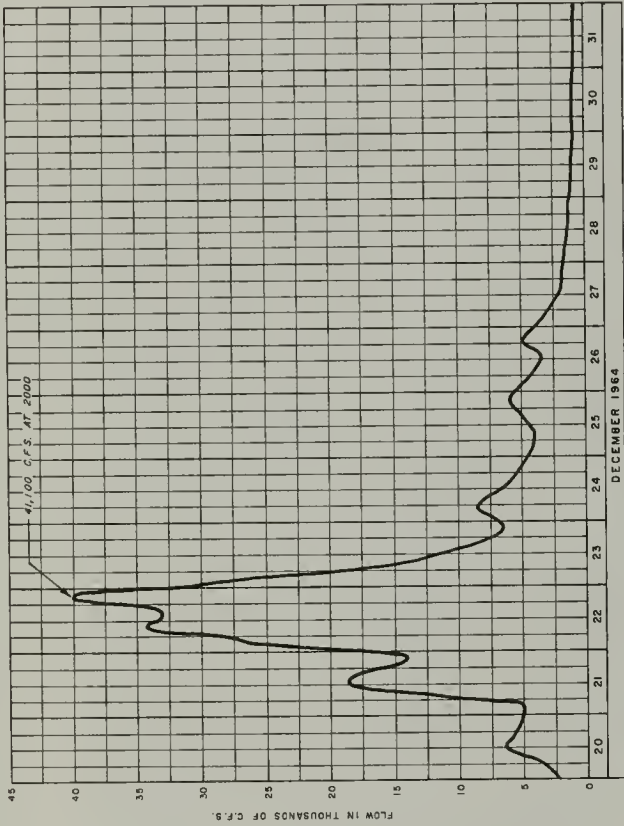






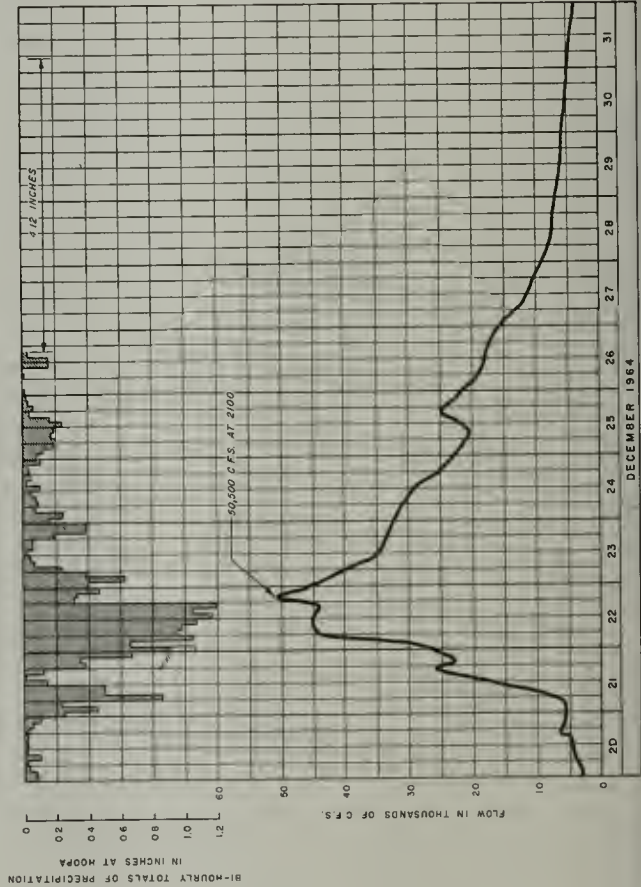
MIDDLE FORK SMITH RIVER AT GASQUET

PERIOD OF RECORD: 1911.12, 1958 PRESENT
 DATE
 12 22 64
 12 29 55
 12 29 55
 1 12 55
 1 12 55
 FLOW IN C.F.S.
 41,100
 26,000
 15,100
 15,100



REDWOOD CREEK AT ORICK

PERIOD OF RECORD: 1911.12 1952 PRESENT
 DATE
 12 22 64
 12 29 55
 1 12 55
 1 18 51
 1 20 64
 FLOW IN C.F.S.
 50,500
 50,000
 50,000
 50,000
 37,700

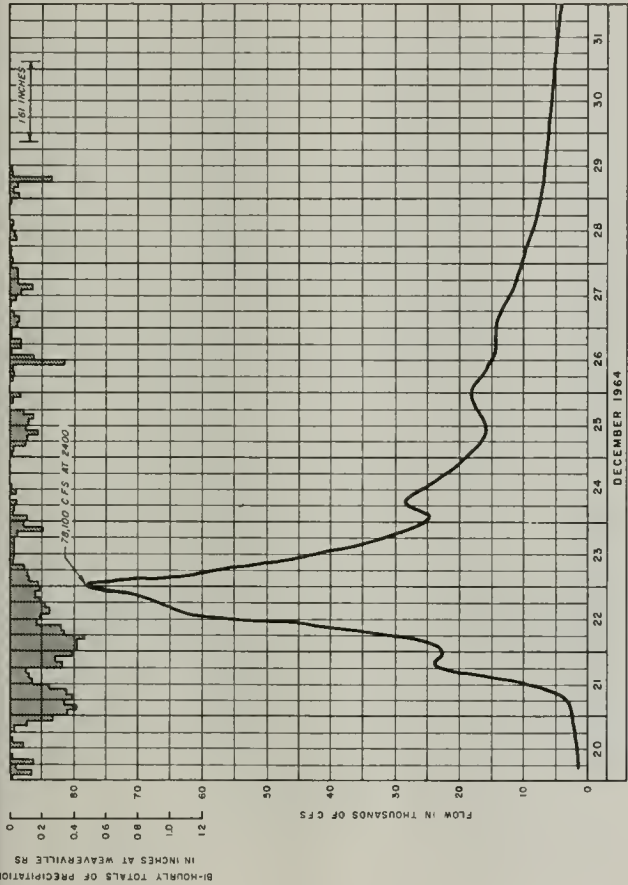


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 HIGH WATER OF 1964-65
 DECEMBER 1964 STORM

HYDROGRAPHS OF SMITH
 RIVER AND REDWOOD CREEK

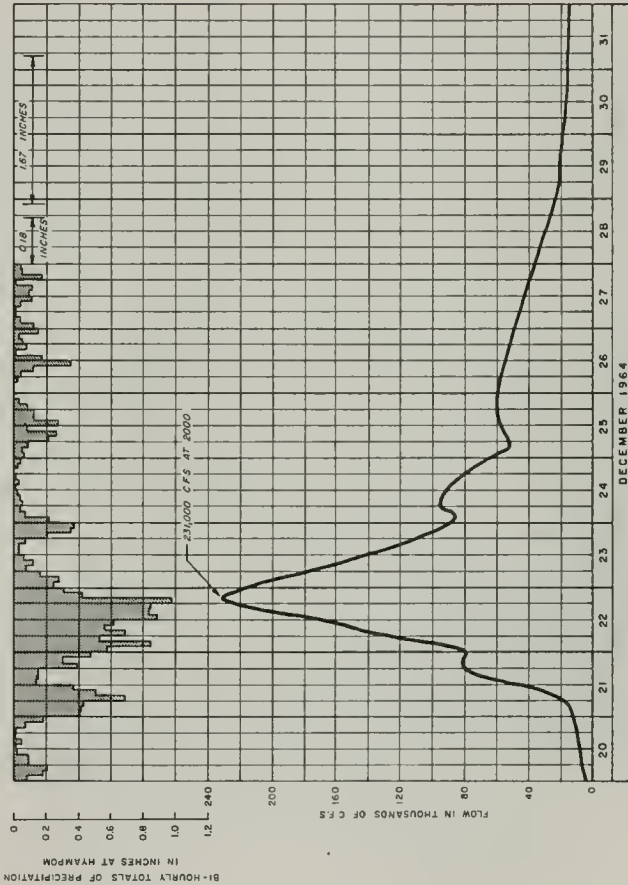
TRINITY RIVER NEAR BURNT RANCH

PERIOD OF RECORD 1931-1942, 1956, PRESENT	
DATE	FLOW IN C.F.S.
12-22-35	172,000
12-22-40	151,000
12-22-40	86,500
12-22-44	78,100



TRINITY RIVER NEAR HOOPA

PERIOD OF RECORD 1911-14, 1916-18, 1931, PRESENT	
DATE	FLOW IN C.F.S.
12-22-35	172,000
12-22-40	151,000
12-22-40	86,500
12-22-44	78,100

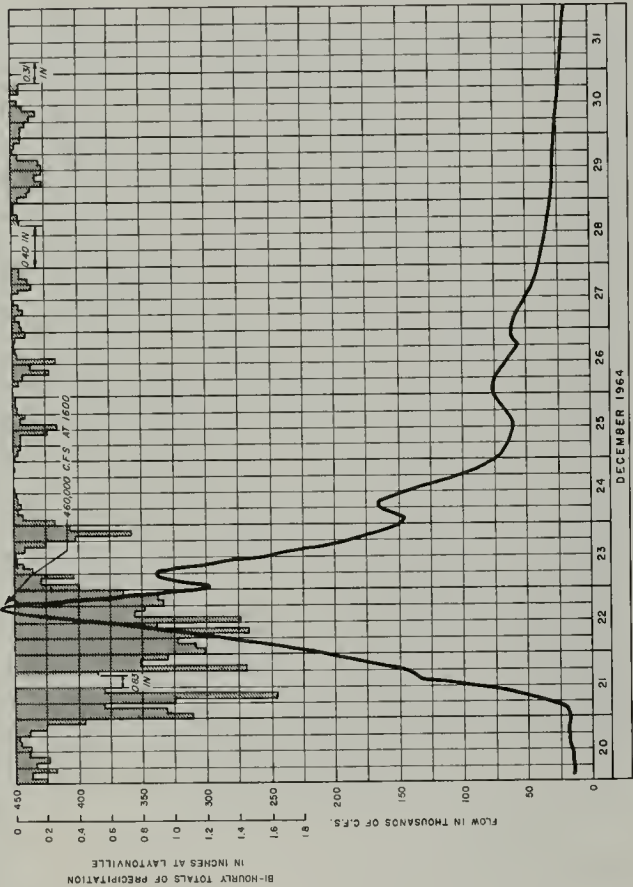


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HIGH WATER OF 1964-65
DECEMBER 1964 STORM

EEL RIVER BELOW DOS RIOS

PERIOD OF RECORD 1911-12, 1951-64

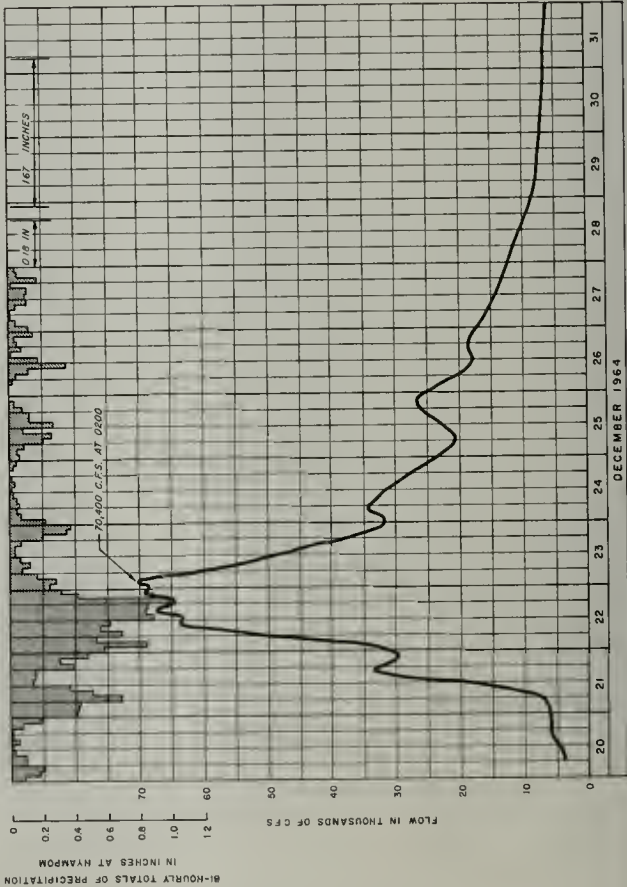
DATE	FLOW IN C.F.S.
12-22-64	180,000
12-23-64	150,000
12-24-64	185,000
12-25-64	190,000
12-26-64	195,000
12-27-64	190,000
12-28-64	185,000
12-29-64	180,000
12-30-64	175,000
12-31-64	170,000



MAD RIVER NEAR ARCATA

PERIOD OF RECORD 1910-1913, 1950 PRESENT

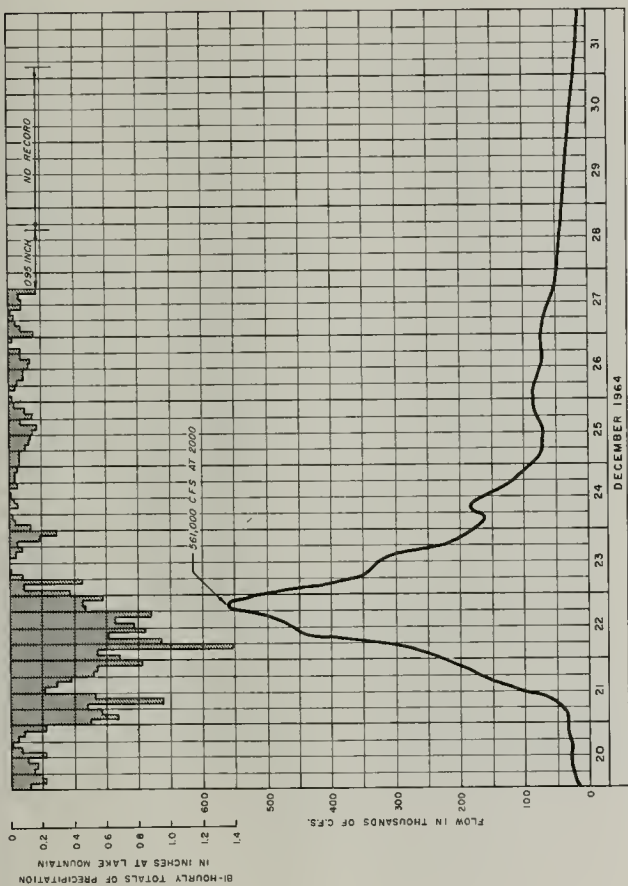
DATE	FLOW IN C.F.S.
12-22-55	75,000
12-23-55	70,000
12-24-55	75,000
12-25-55	70,000
12-26-55	75,000
12-27-55	70,000
12-28-55	75,000
12-29-55	70,000
12-30-55	75,000
12-31-55	70,000



EEL RIVER AT ALGERPOINT

PERIOD OF RECORD 1955 - PRESENT

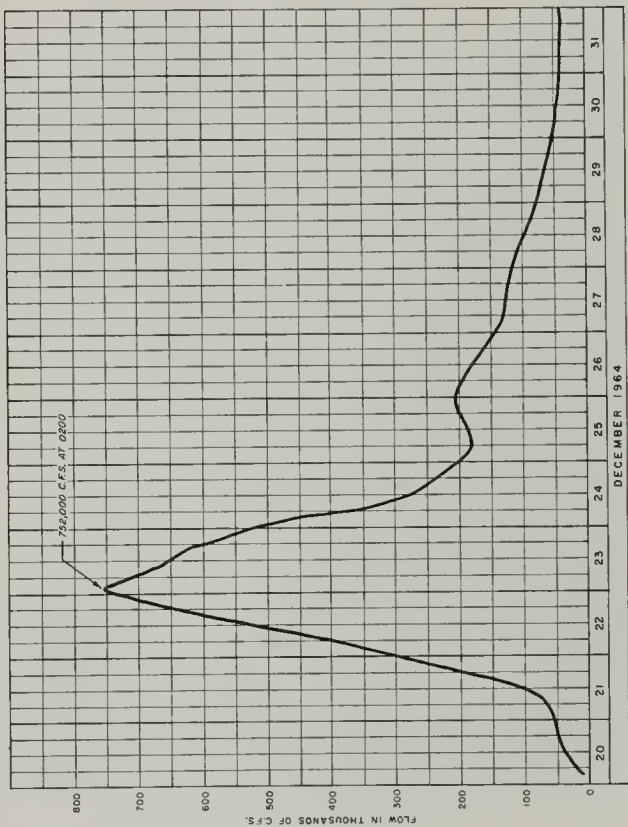
DATE	FLOW IN C.F.S.
12 22 64	561,000
12 23 64	561,000
12 24 64	561,000
12 25 64	220,000
12 26 64	195,000
1 31 65	195,000



EEL RIVER AT SCOTIA

PERIOD OF RECORD 1910 - PRESENT

DATE	FLOW IN C.F.S.
12 22 64	756,000
12 23 64	756,000
12 24 64	756,000
12 25 64	220,000
12 26 64	195,000
1 31 65	195,000

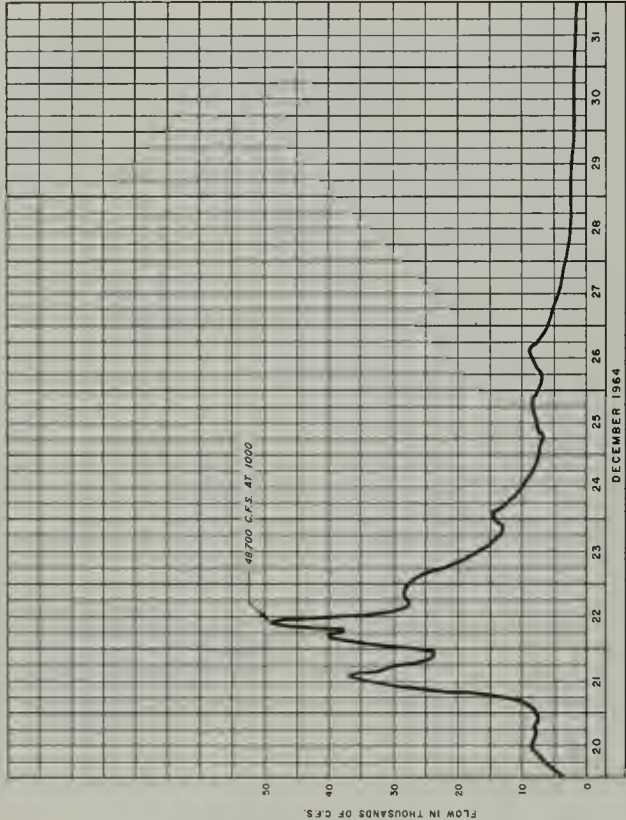


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STATEWIDE OPERATIONS OFFICE
HIGH WATER OF 1964-65
DECEMBER 1964 STORM

HYDROGRAPHS OF EEL RIVER

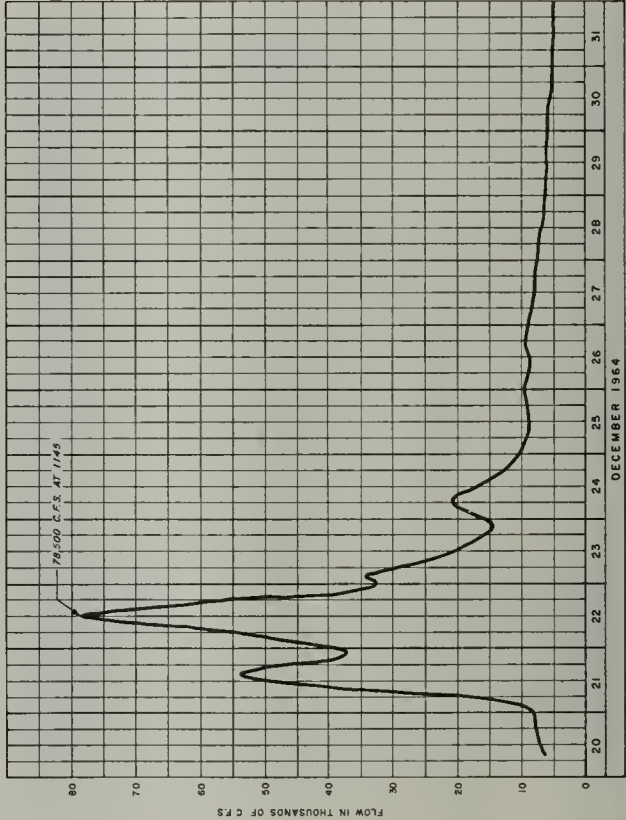
VAN DUZEN RIVER NEAR BRIDGEVILLE

PERIOD OF RECORD 1950 PRESENT		FLOW IN C.F.S.	
DATE			
12 25 64		48 700	
1 12 65		42 500	
1 12 65		42 500	
1 12 65		42 500	
2 21 56		31 000	



MATTOLE RIVER NEAR PETROLIA

PERIOD OF RECORD 1911 1912 1950 PRESENT		FLOW IN C.F.S.	
DATE			
12 25 53		90 400	
1 12 64		82 500	
2 28 60		42 500	
1 25 12		48 000	



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HIGH WATER OF 1964-65
DECEMBER 1964 STORM

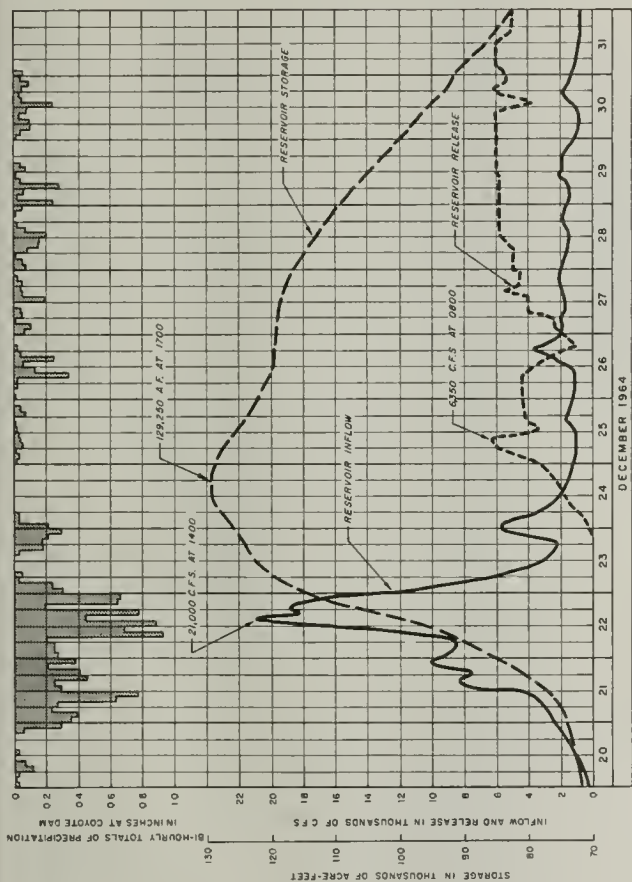
LAKE MENDOCINO (COYOTE DAM)

GROSS POOL 122,500 ACRES FEET COMPLETED 1939

PERIOD OF RECORD 1939-PRESENT

DATE
12/27/64
2 78.40
2 8.40
1 31.63

INFLOW IN C.F.S.
10,000
10,000
8,000

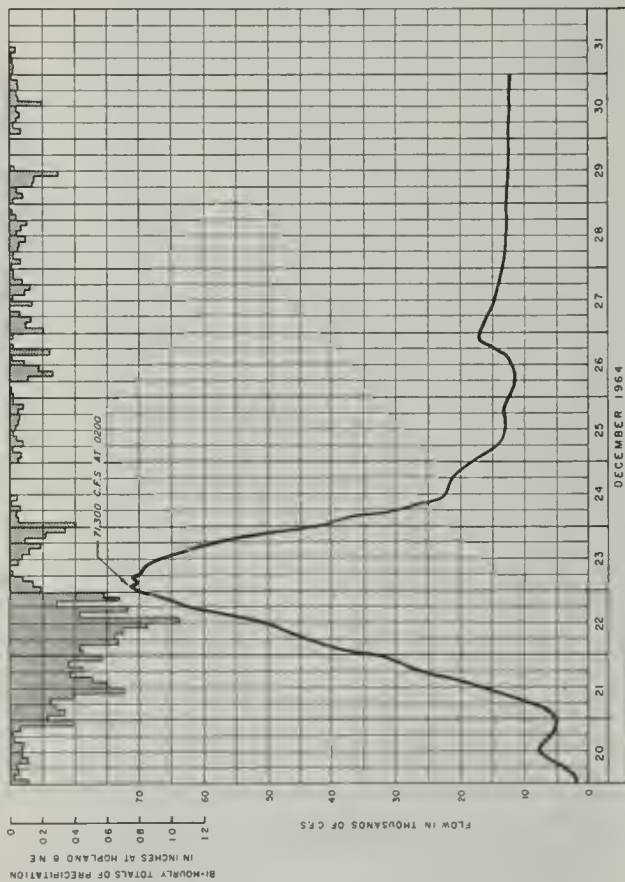


RUSSIAN RIVER NEAR HEALDSBURG

PERIOD OF RECORD 1929 PRESENT

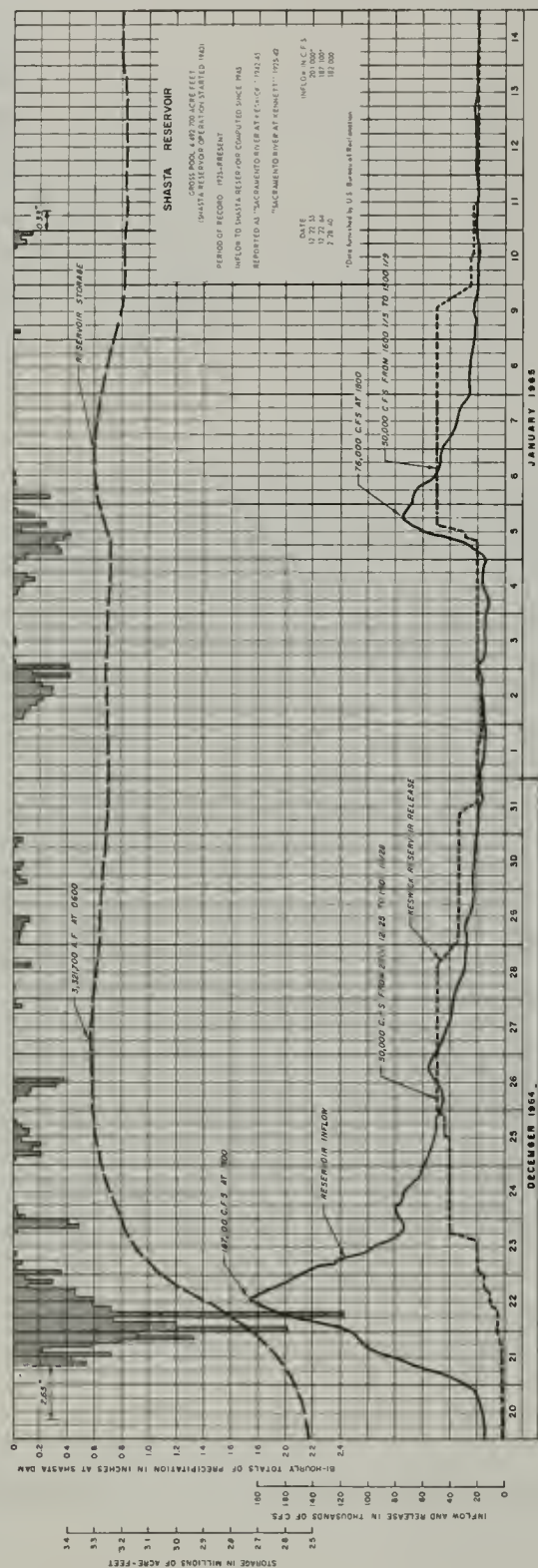
DATE
12/27/64
2 78.40
2 8.40
1 31.63

INFLOW IN C.F.S.
10,000
10,000
8,000

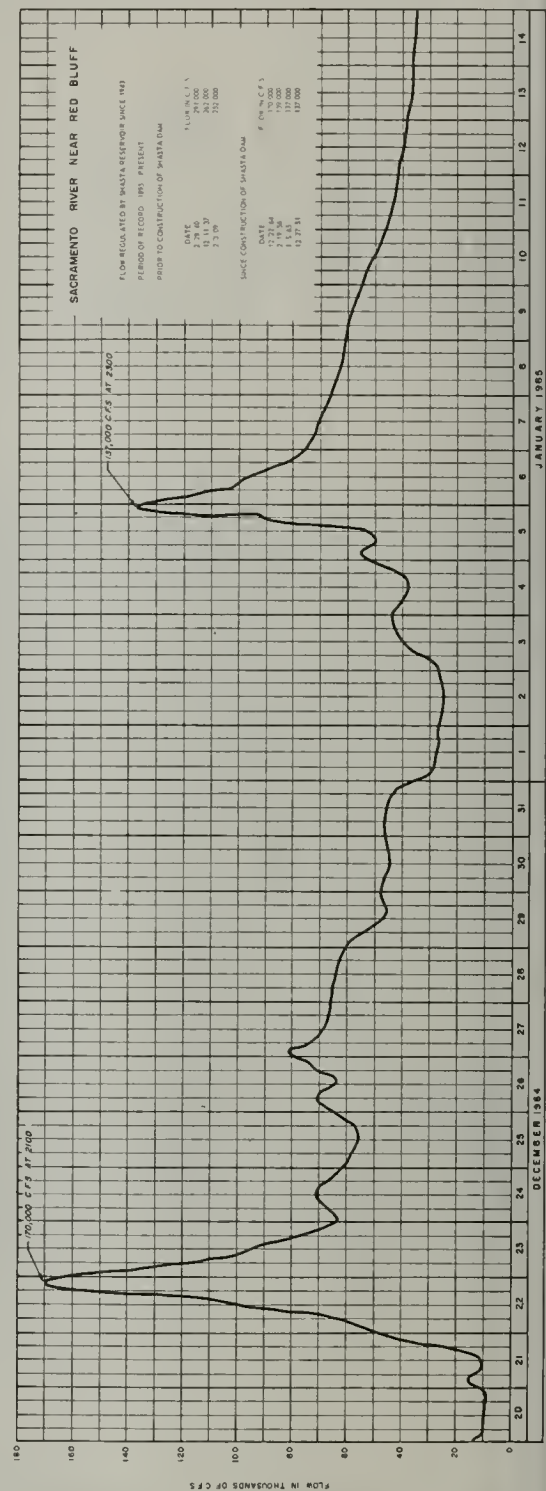


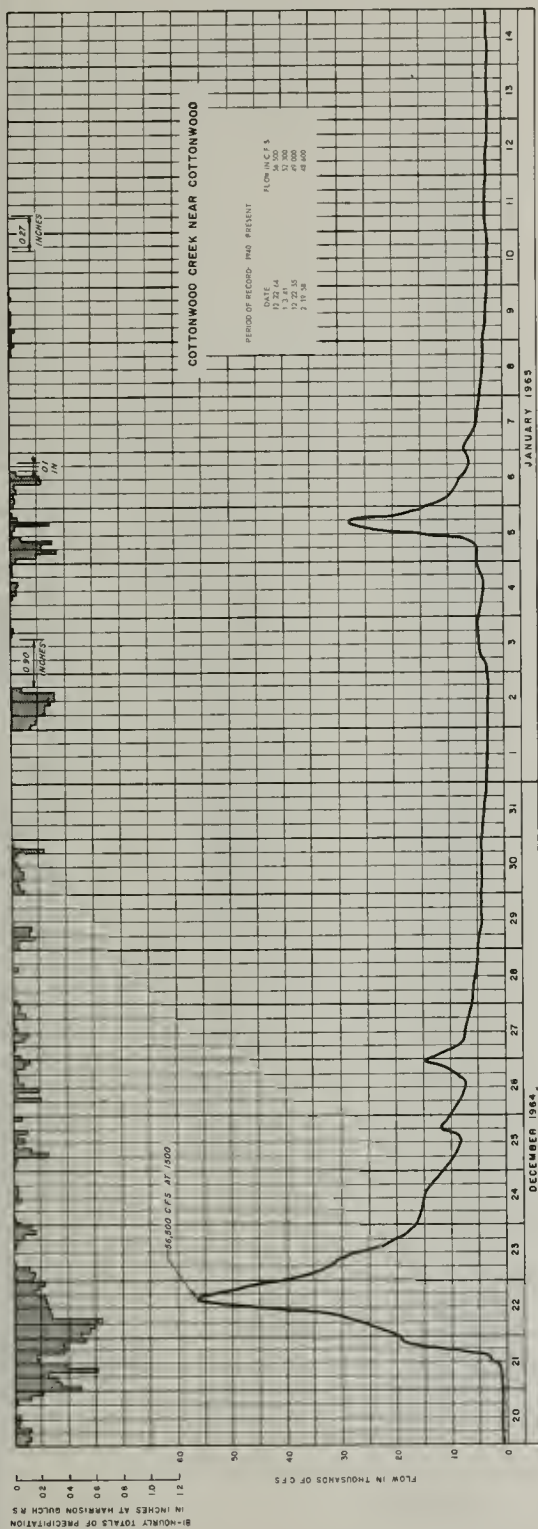
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE
HIGH WATER OF 1964-65
DECEMBER 1964 STORM

OPERATION OF LAKE MENDOCINO RESERVOIR AND HYDROGRAPH OF RUSSIAN RIVER



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE
HIGH WATER OF 1964-65
DECEMBER 1964 - JANUARY 1965 STORM
OPERATION OF
SHASTA RESERVOIR AND
HYDROGRAPH OF SACRAMENTO RIVER

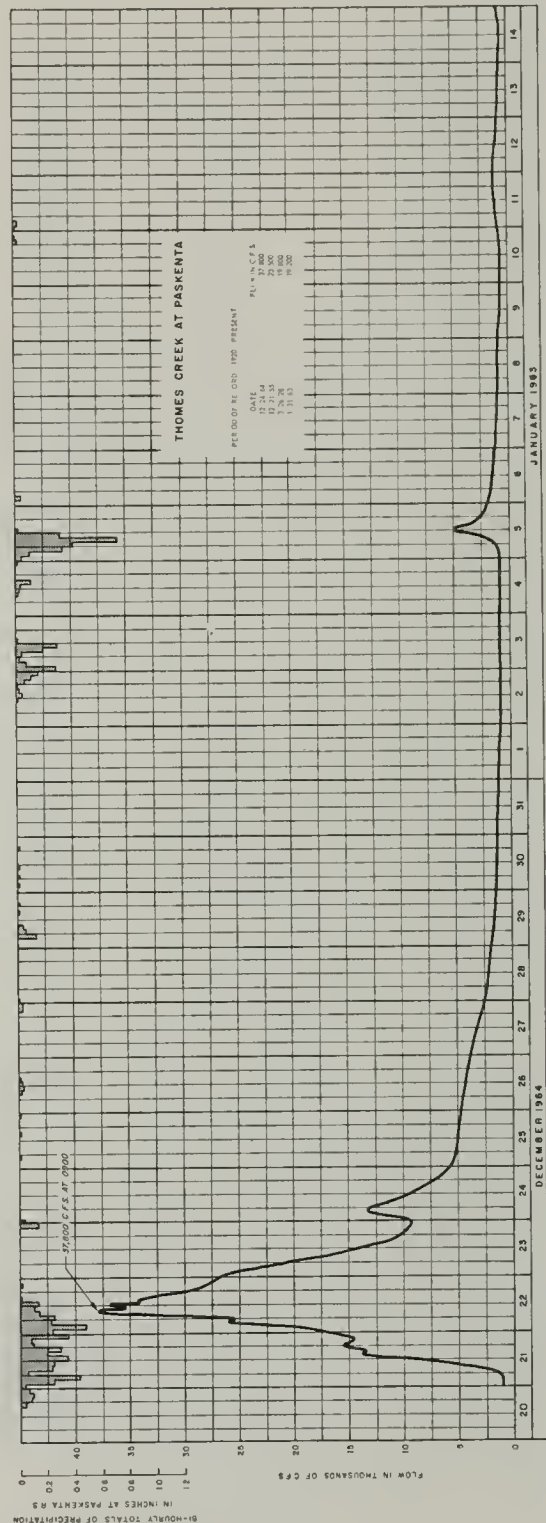


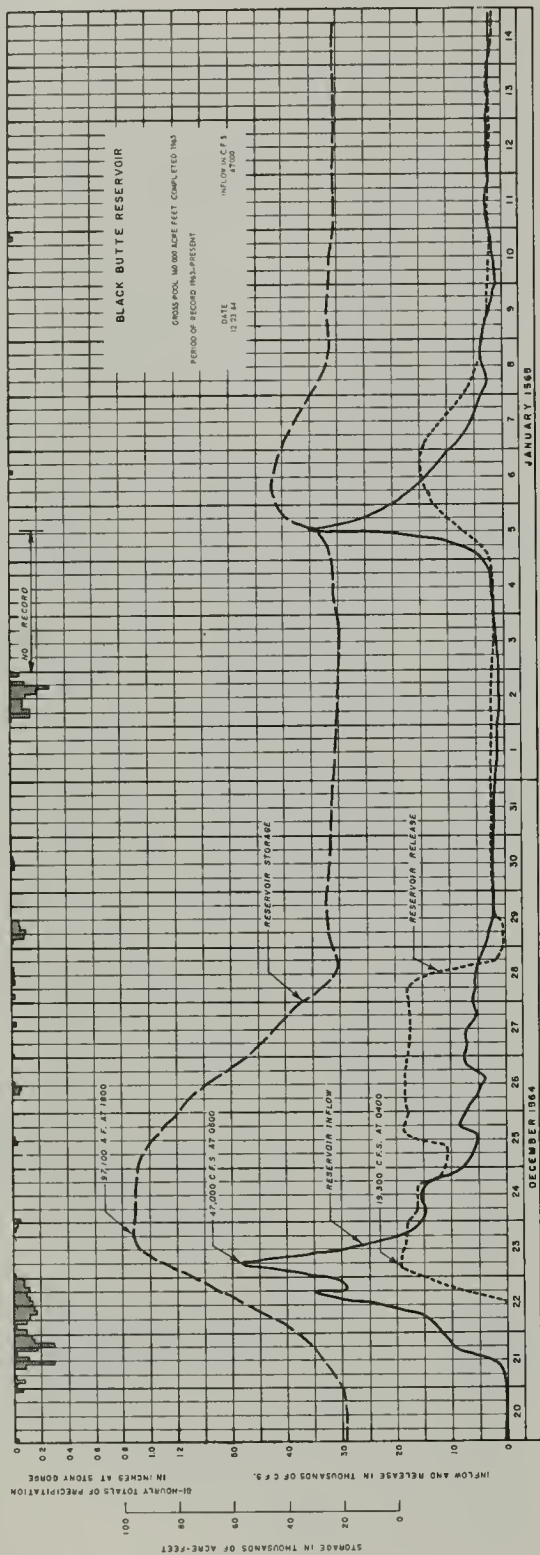


STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

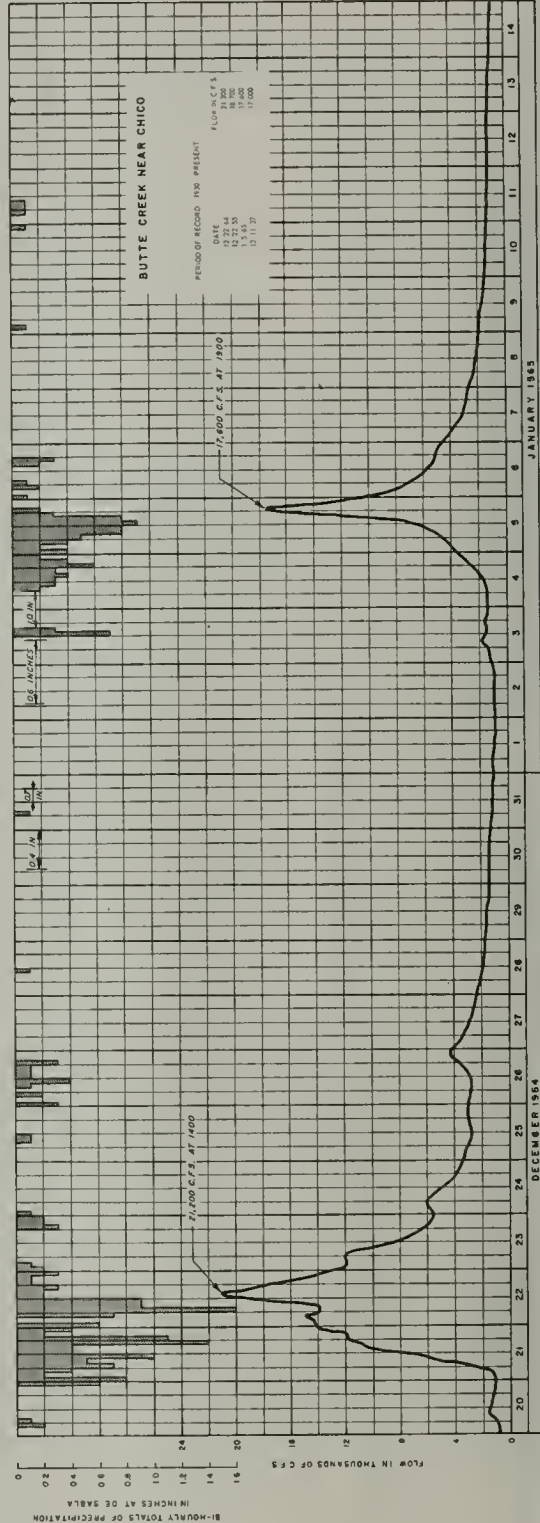
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HIGH WATER OF 1964-65
DECEMBER 1964-JANUARY 1965 STORM

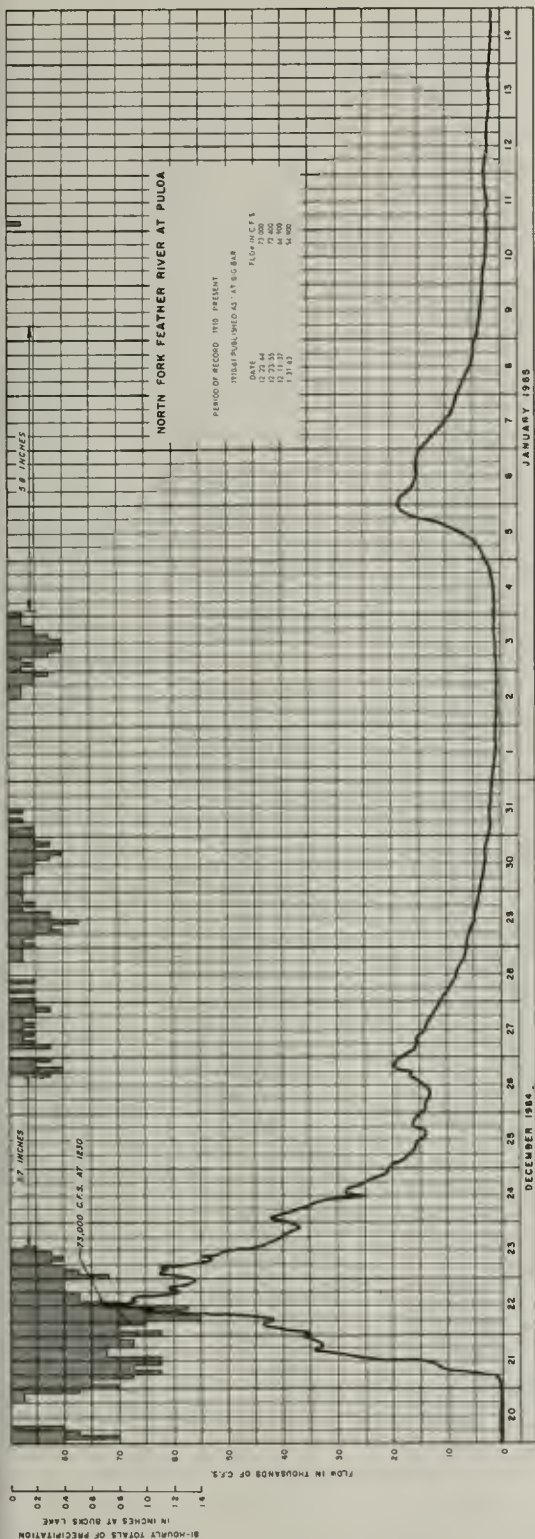
HYDROGRAPHS OF COTTONWOOD AND THOMES CREEKS



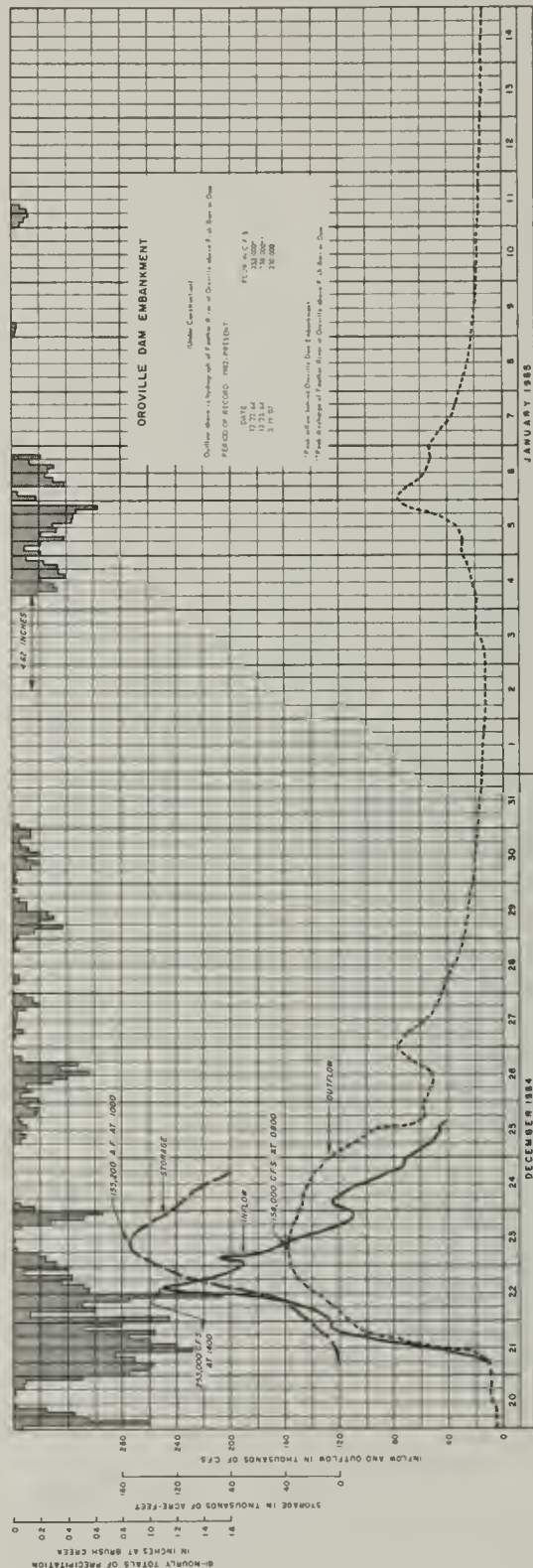


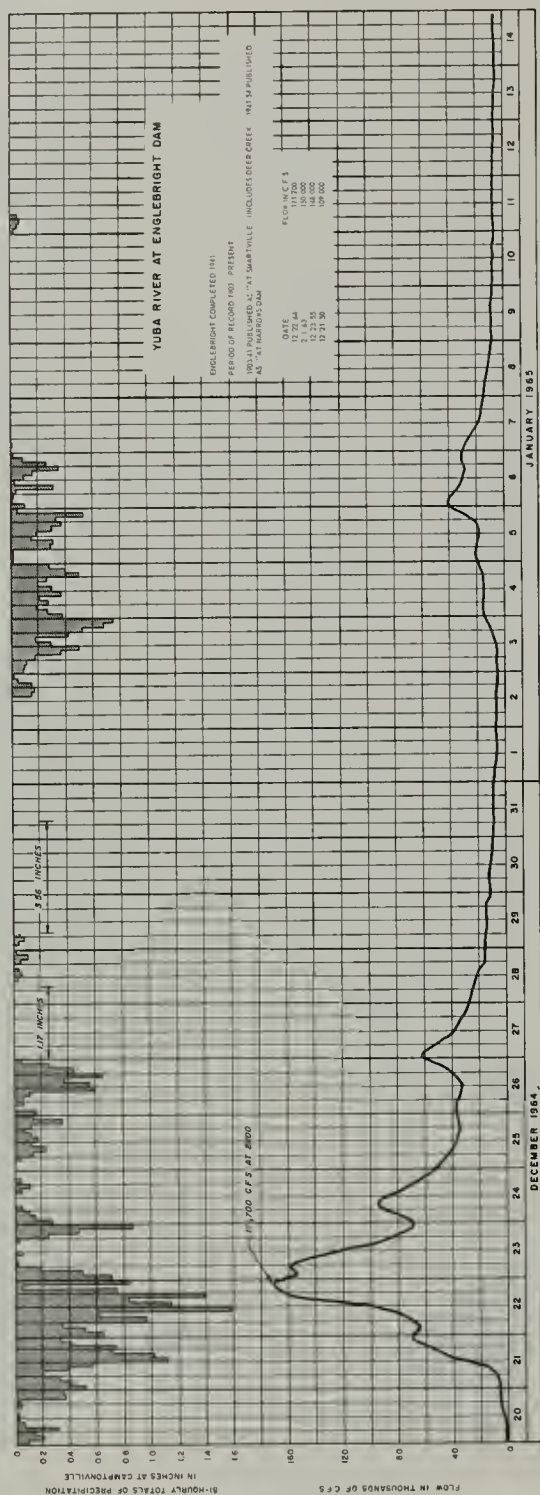
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE
HIGH WATER OF 1964-65
DECEMBER 1964-JANUARY 1965 STORM
OPERATION OF BLACK BUTTE
RESERVOIR, STONY CREEK, AND
HYDROGRAPH OF BUTTE CREEK





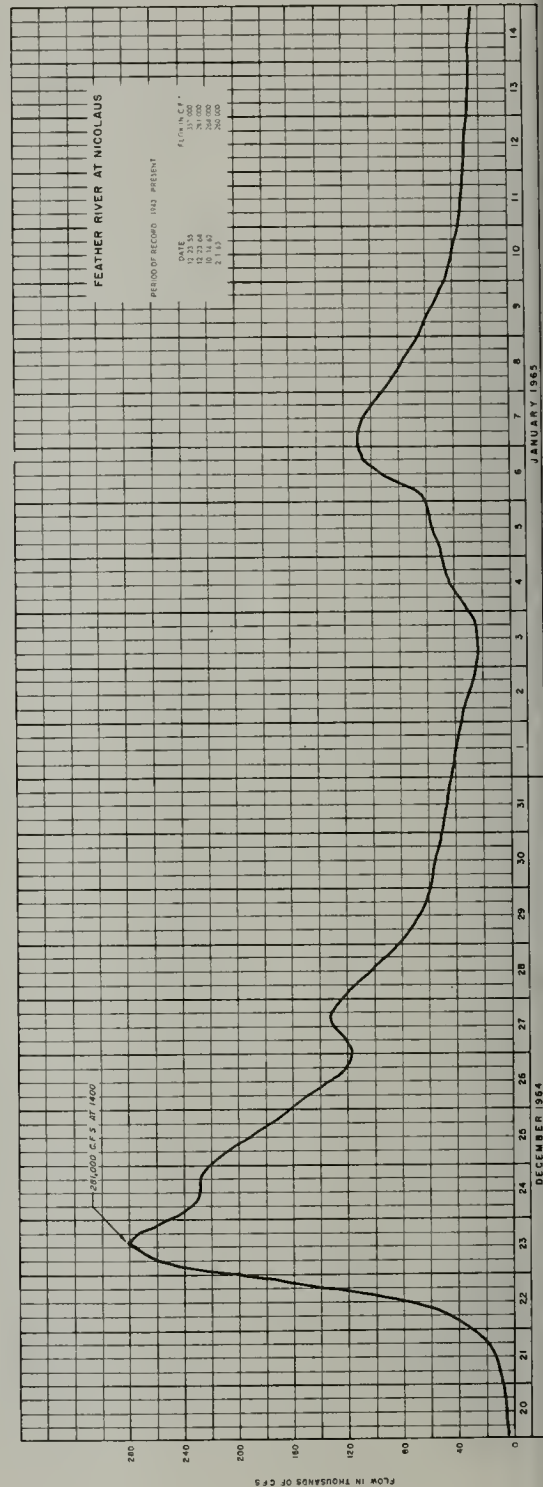
STATE OF CALIFORNIA
 THE RESOURCES AGENCY
 DEPARTMENT OF WATER RESOURCES
 STATEWIDE OPERATIONS OFFICE
 HIGH WATER OF 1964-65
 DECEMBER 1964 - JANUARY 1965 STORM
 HYDROGRAPH OF
 FEATHER RIVER, AND
 OROVILLE DAM EMBANKMENT

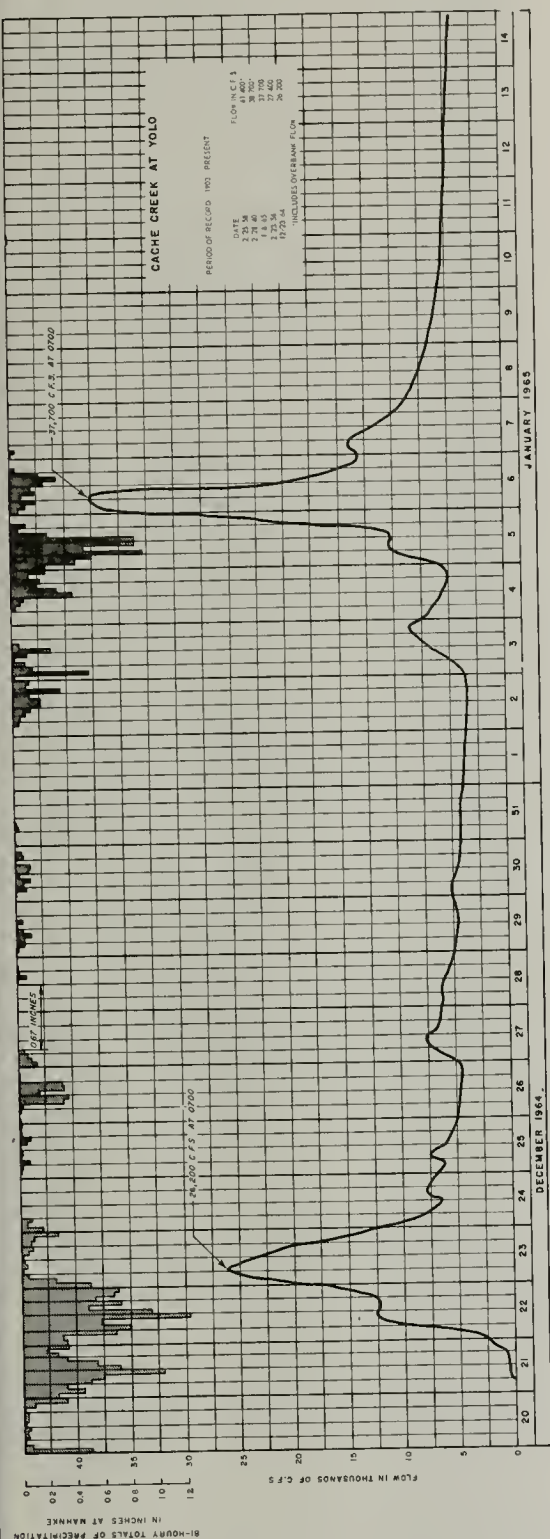




STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE

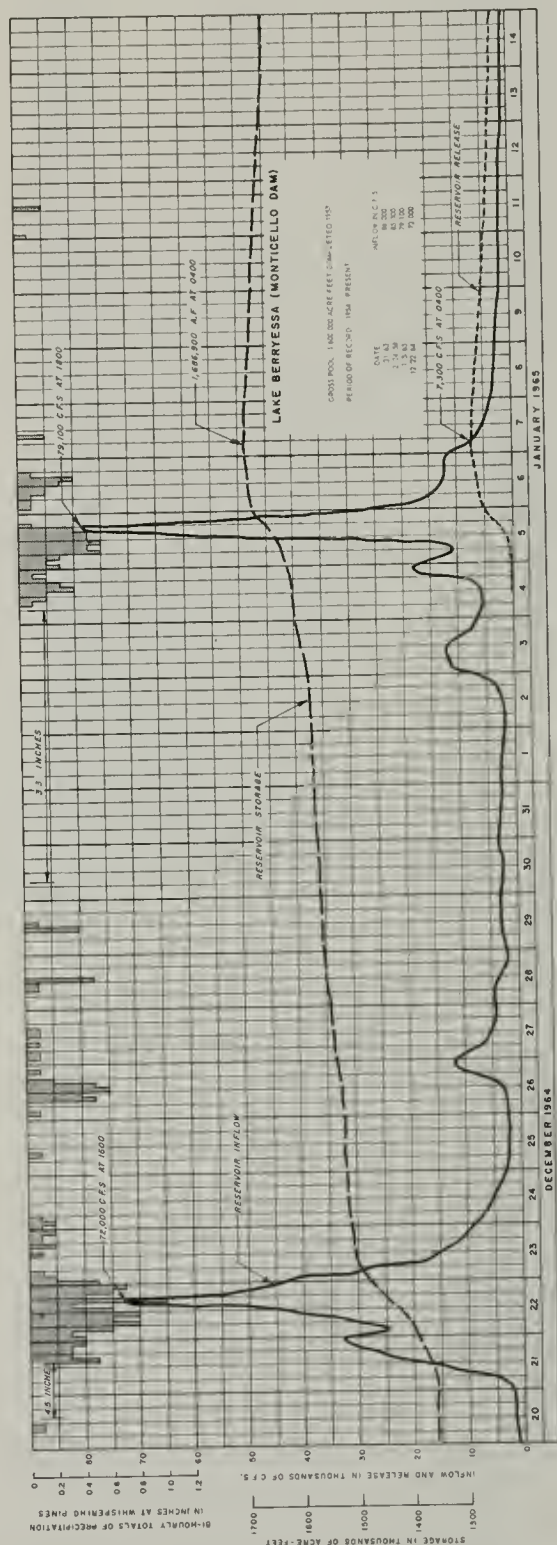
HIGH WATER DF 1964-65

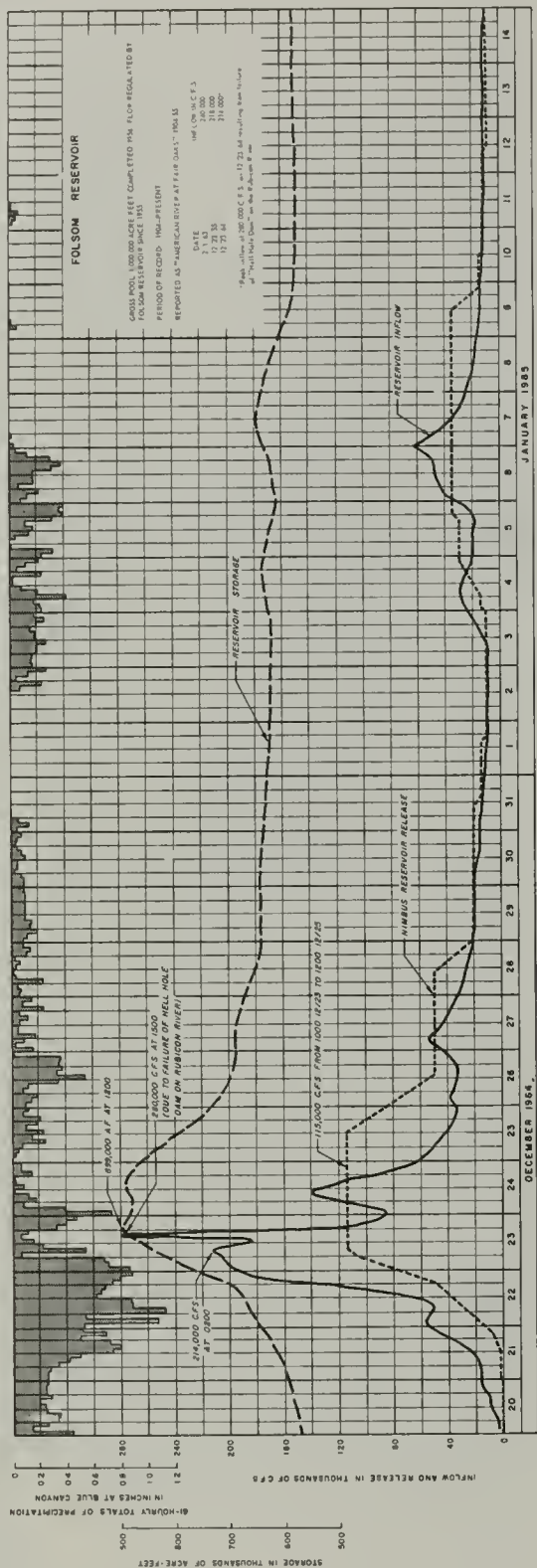
HYDROGRAPHS OF
YUBA AND FEATHER RIVERS



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THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE

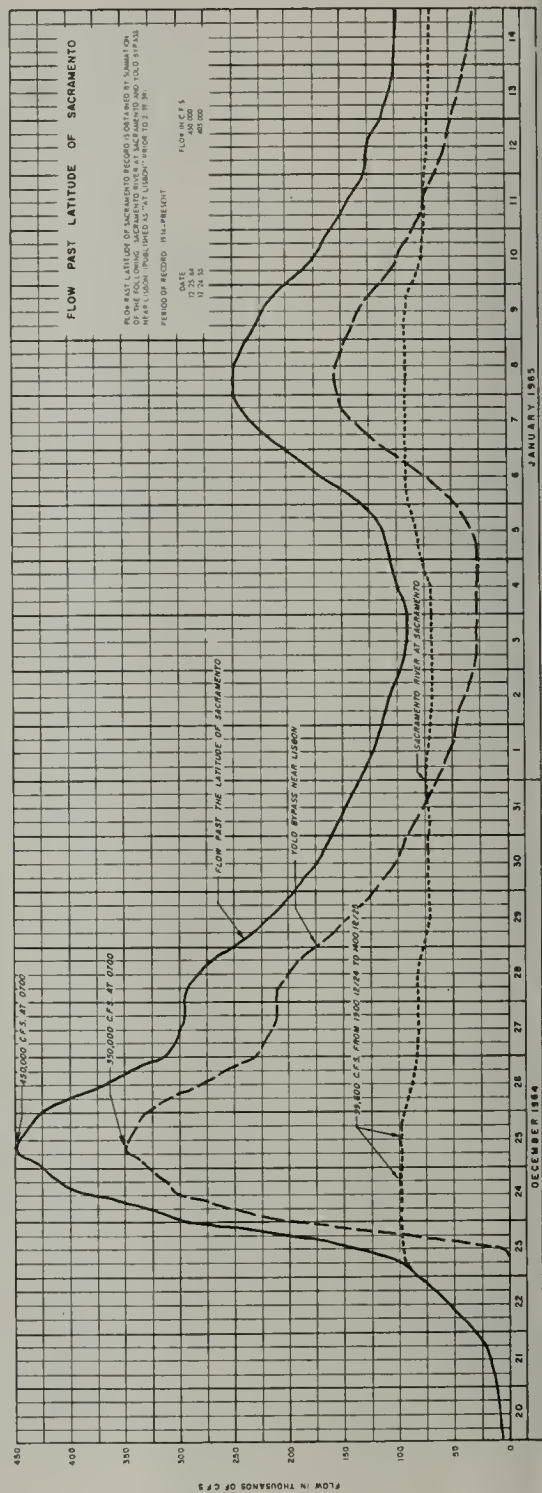
HIGH WATER OF 1964-65
DECEMBER 1964 - JANUARY 1965 STORM
HYDROGRAPH OF CACHE CREEK
AND OPERATION OF LAKE BERRYESSA
RESERVOIR, PUTAH CREEK

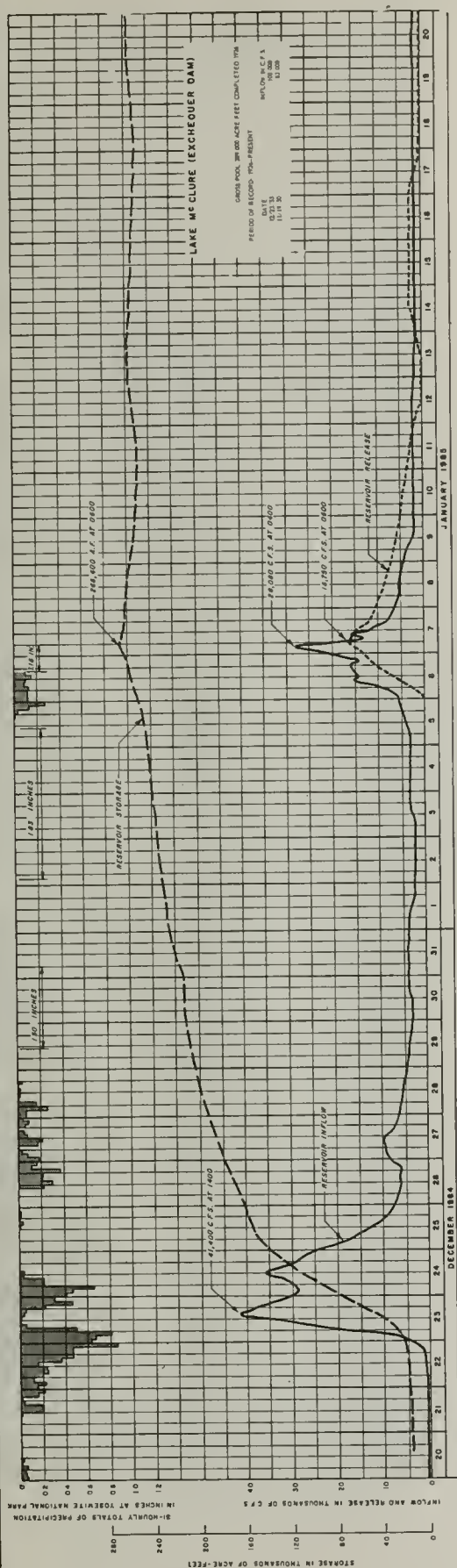




STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE
HIGH WATER OF IS64-65

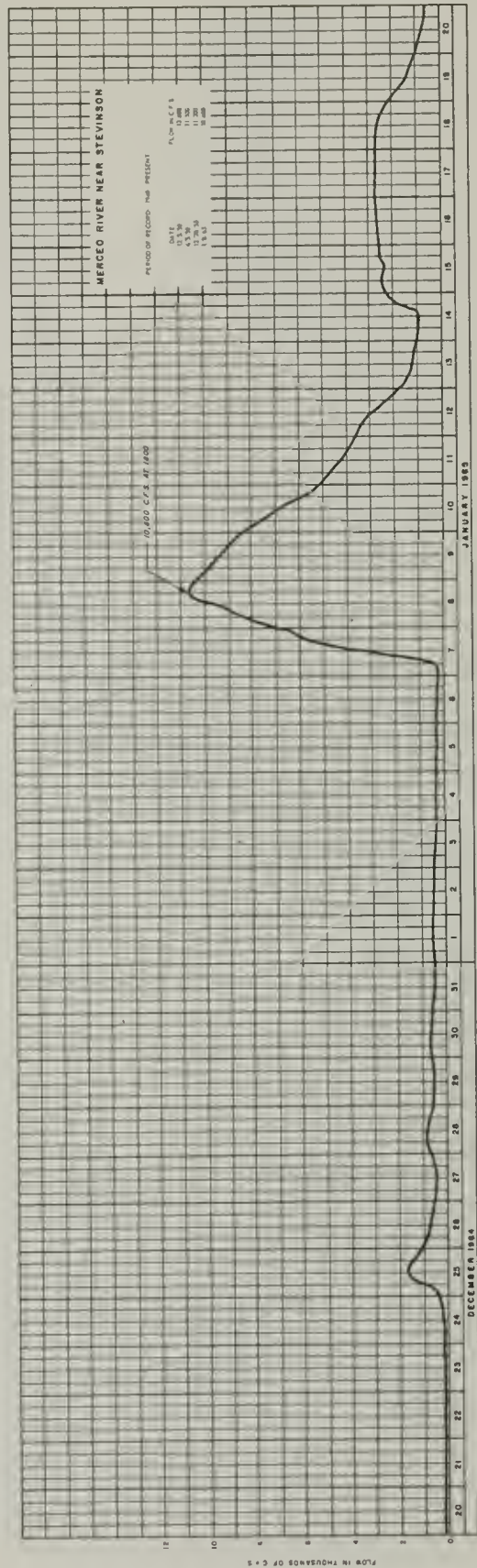
DECEMBER 1964 - JANUARY 1965 STORM
OPERATION OF FOLSOM RESERVOIR,
AMERICAN RIVER, AND HYDROGRAPHS OF
LOW PAST LATITUDE OF SACRAMENTO

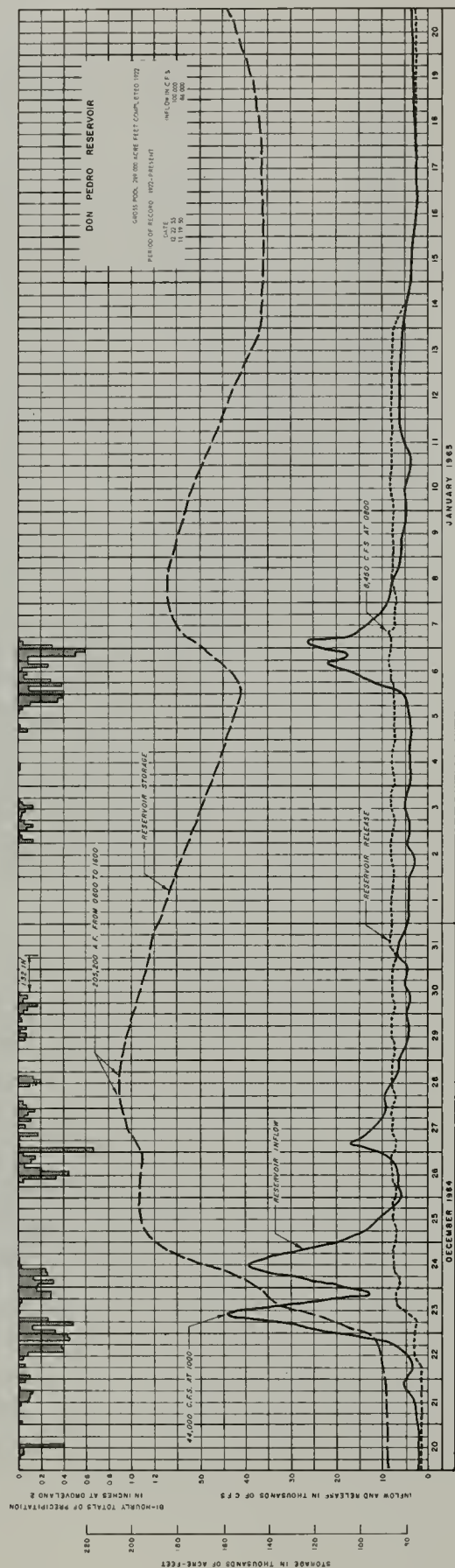




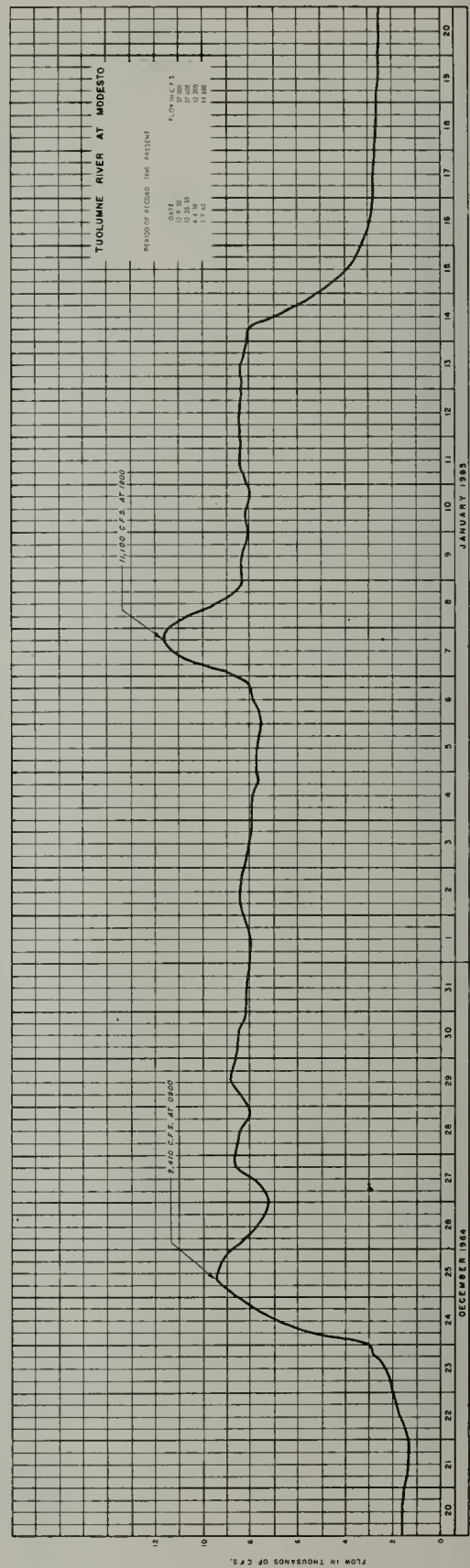
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE
HIGH WATER OF 1984-85

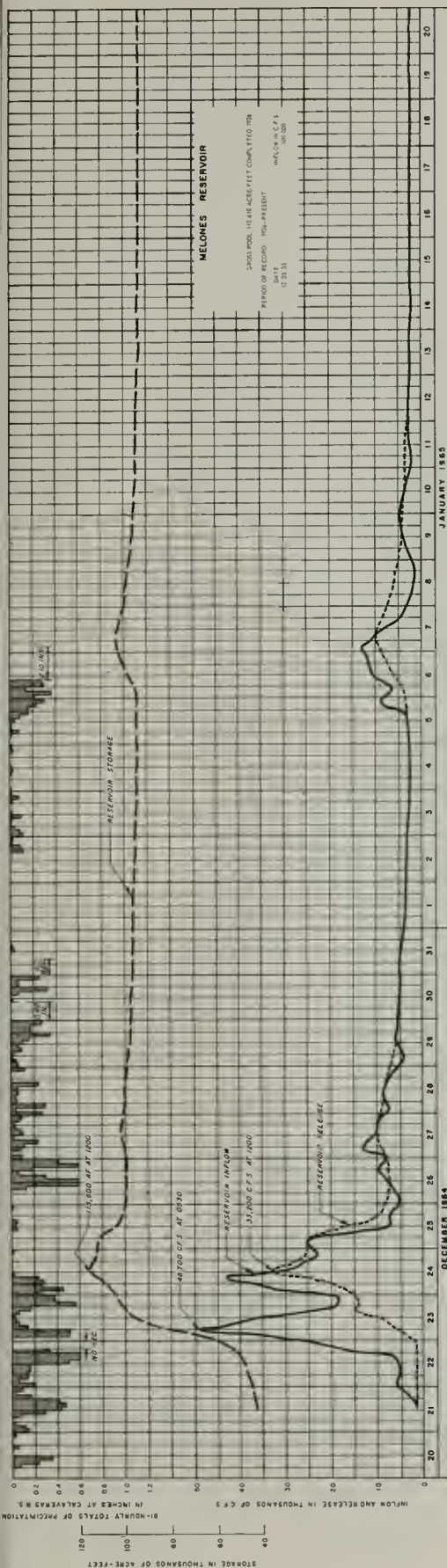
OPERATION OF LAKE M^cCLURE RESERVOIR AND HYDROGRAPH OF MERCED RIVER



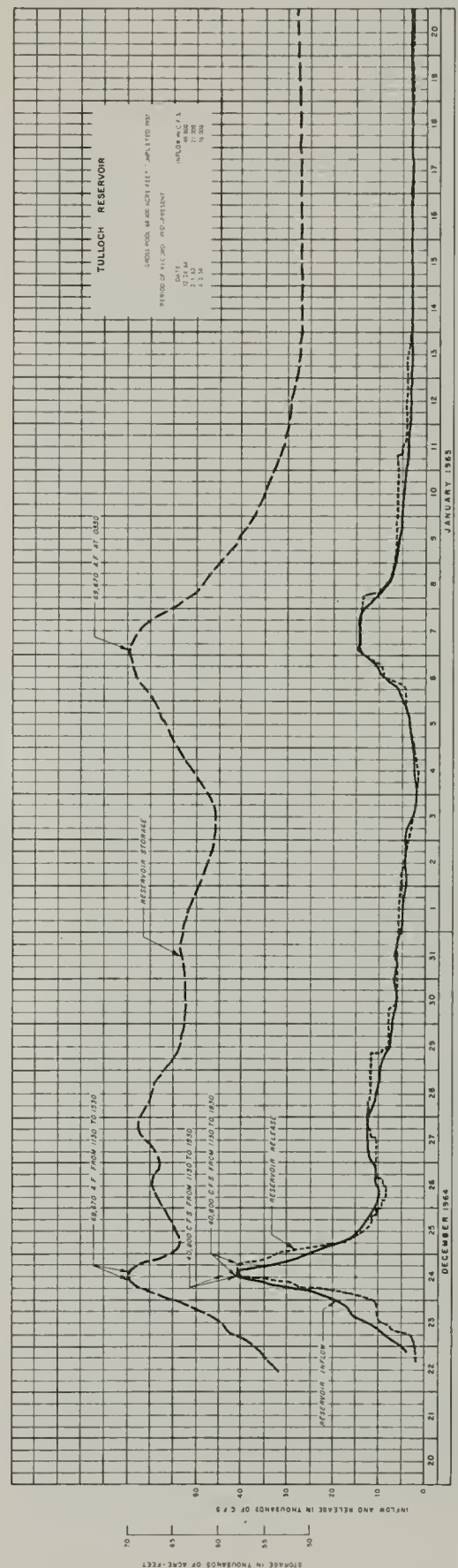


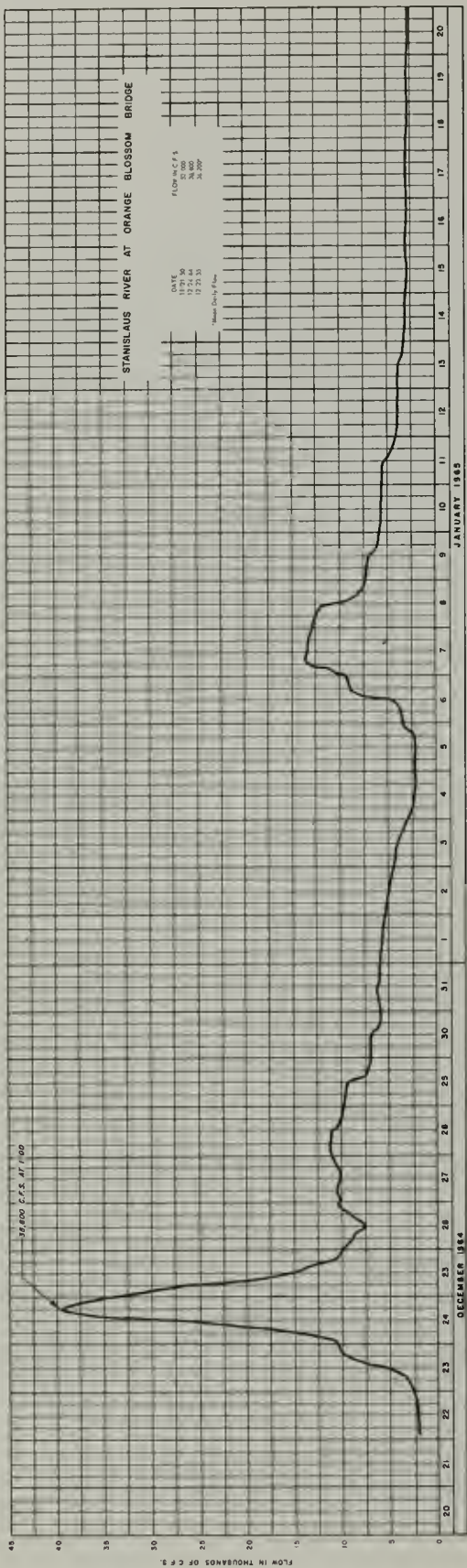
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE
HIGH WATER OF 1964-65
DECEMBER 1964 - JANUARY 1985 STORM
OPERATION OF
DON PEDRO RESERVOIR AND
HYDROGRAPH OF TUOLUMNE RIVER





STATE OF CALIFORNIA
 THE RESOURCES AGENCY
 DEPARTMENT OF WATER RESOURCES
 STATEWIDE OPERATIONS OFFICE
 HIGH WATER OF 1964-65
 DECEMBER 1964 - JANUARY 1965 STORM
 OPERATION OF
 MELONES AND TULLOCH RESERVOIRS,
 STANISLAUS RIVER

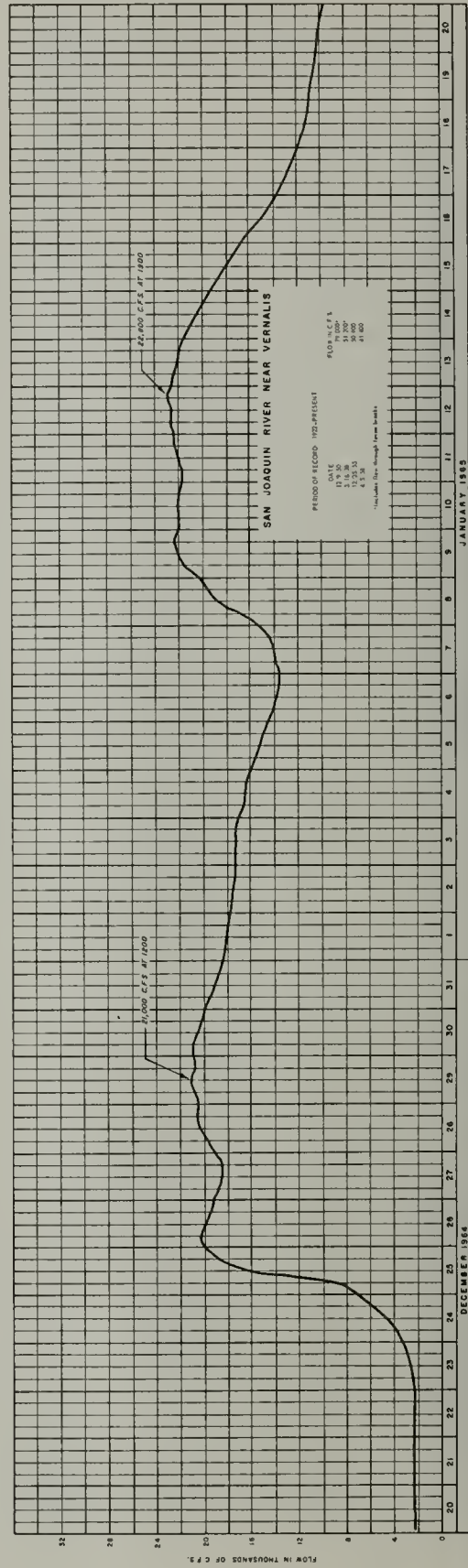


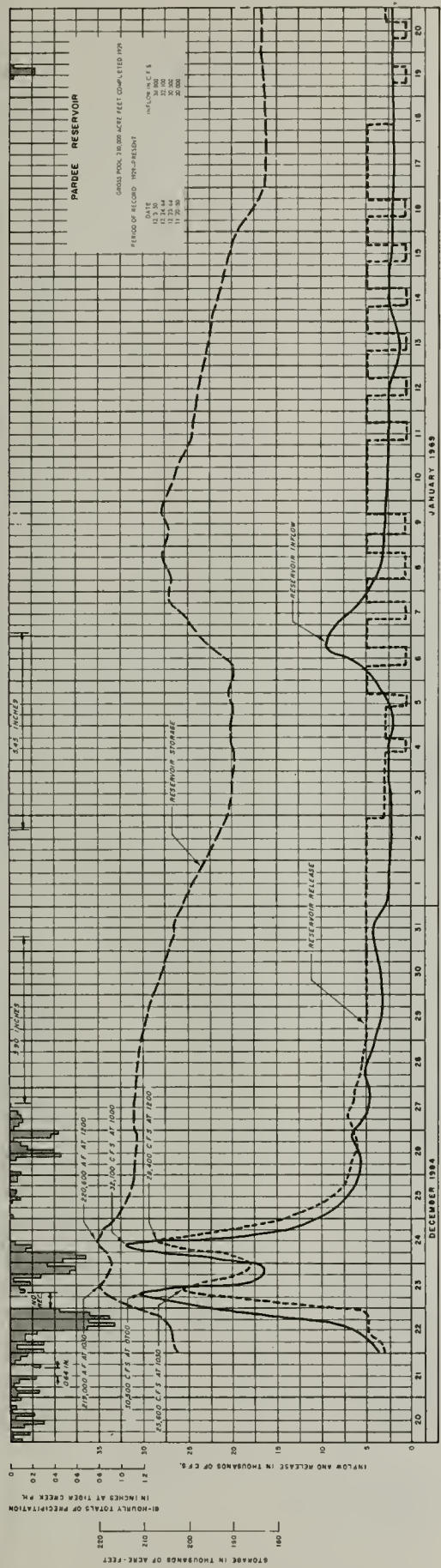


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THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE

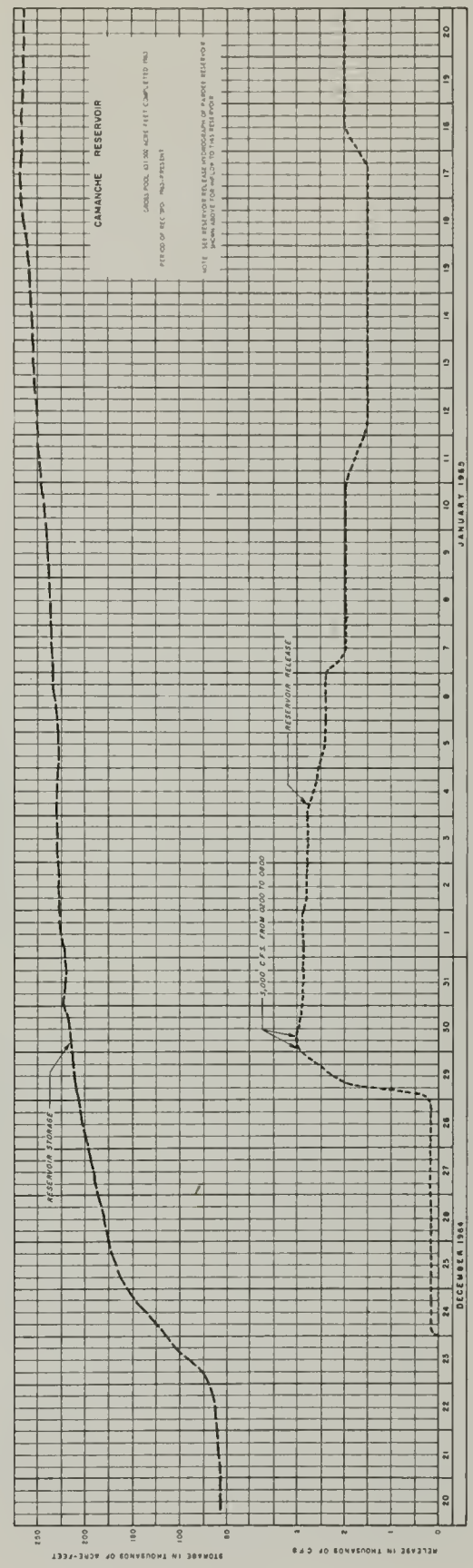
HIGH WATER OF 1964-65
DECEMBER 1964 - JANUARY 1965 STORM

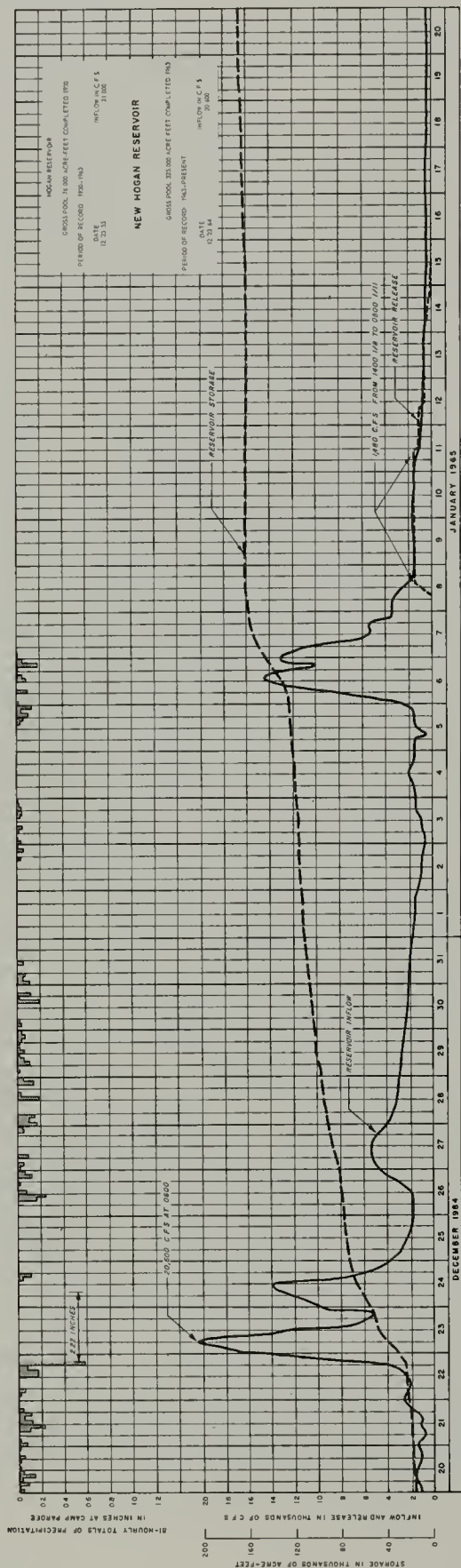
HYDROGRAPHS OF STANISLAUS AND SAN JOAQUIN RIVERS





STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE
HIGH WATER OF 1964-65
DECEMBER 1964 - JANUARY 1965 STORM
OPERATION OF PARDEE
AND CAMANCHE RESERVOIRS,
MOKELUMNE RIVER

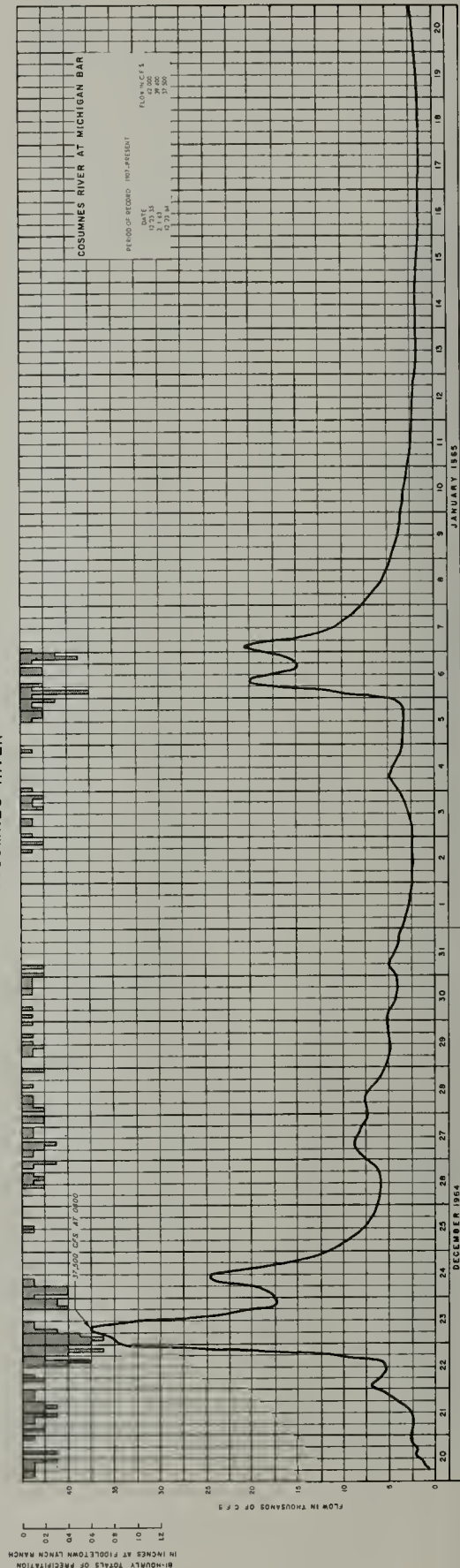


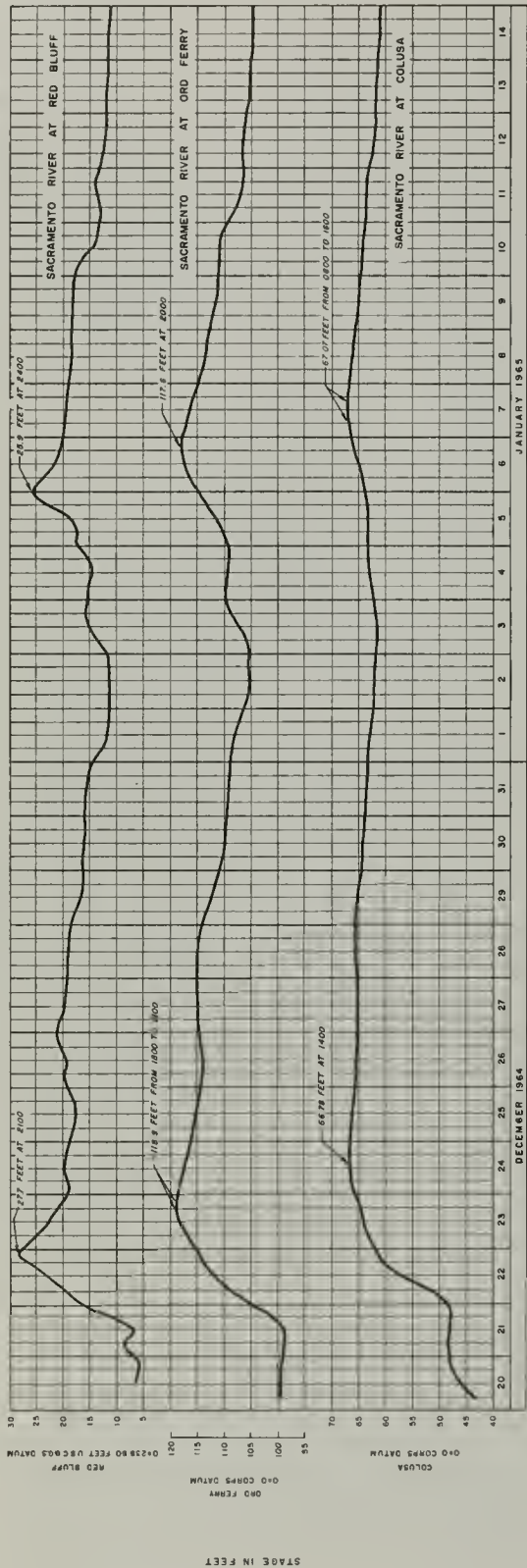


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STATEWIDE OPERATIONS OFFICE

DECEMBER 1964 - JANUARY 1965 STORM
HIGH WATER OF 1964-65

OPERATION OF
NEW HOGAN RESERVOIR,
CALAVERAS RIVER,
AND HYDROGRAPH OF
COSUMNES RIVER

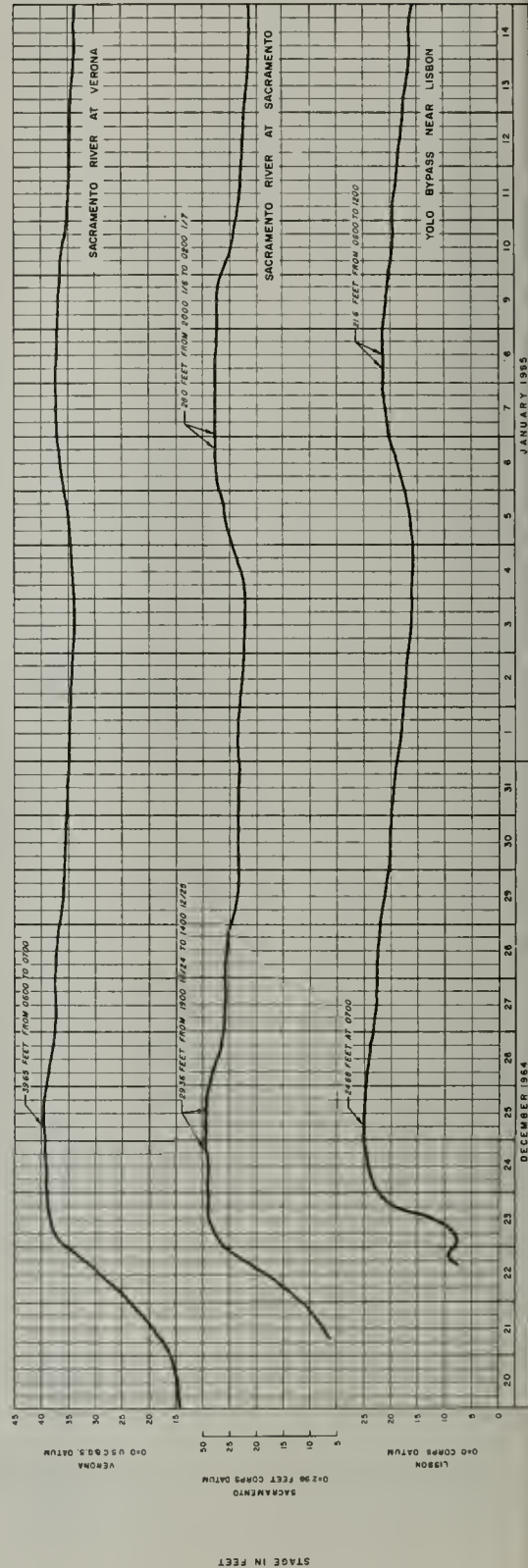


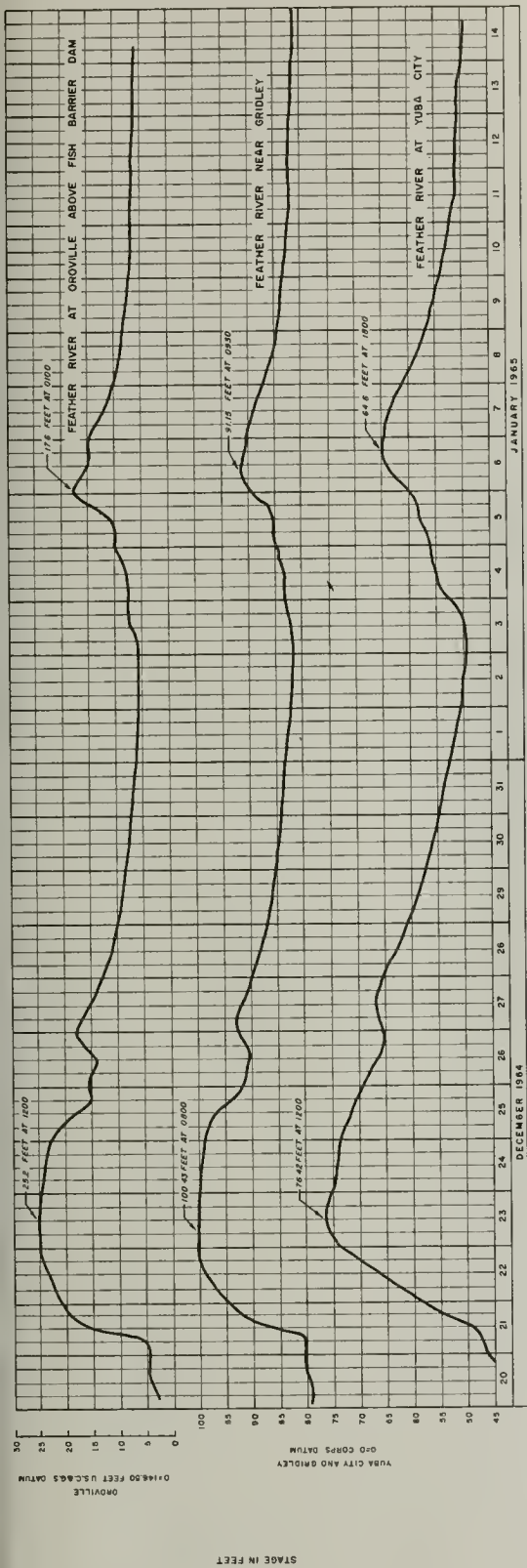


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THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE

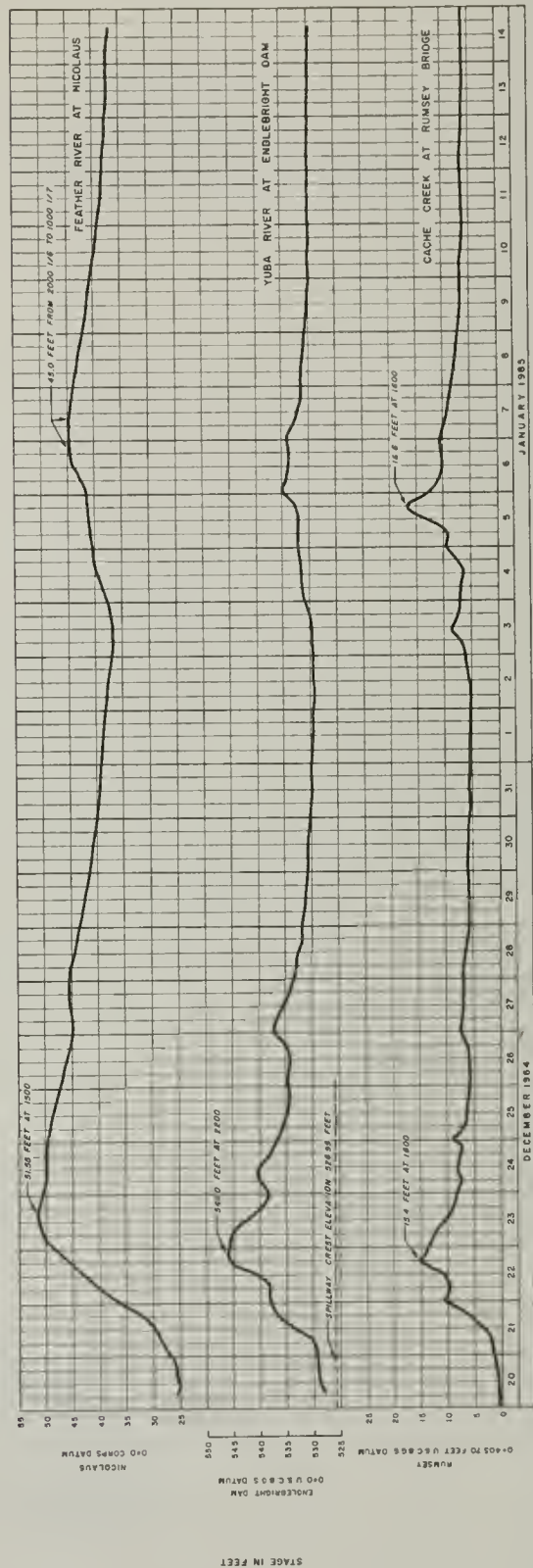
HIGH WATER OF 1964-65
DECEMBER 1964 - JANUARY 1965 STORM

GAGE HEIGHTS OF SACRAMENTO RIVER AND YOLO BYPASS





STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE
HIGH WATER OF 1964-65
DECEMBER 1964 - JANUARY 1965 STORM
GAGE HEIGHTS OF
FEATHER RIVER, YUBA RIVER,
AND CACHE CREEK



LEGEND

- ▲ STREAM GAGING STATION
- HOURLY PRECIPITATION STATION
- DRAINAGE BASIN BOUNDARY
- 5 — ISOHYETS OF RAINFALL IN INCHES
FOR THE PERIOD DEC. 18 - 24, 1964

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2. Smi
3. Sha
4. Sec
5. Kla
6. Sou
7. Nor
8. Sal
9. Kla
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14. No
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17. Sou
18. Sou
19. Ha
20. Ha
21. Sou
22. Wil
23. Tri
24. Kla
25. Re
26. Li
27. Ma
28. No
29. Ma
30. Jac
31. El
32. Ee
33. Ee
34. Ou
35. Ee
36. Bl
37. Mi
38. Ee
39. No
40. Ee
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46. Ee

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STATE OF CALIFORNIA
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NT OF WATER RESOURCES
IDE OPERATIONS OFFICE
WATER OF 1964-65
IBER 1964 STORM

COASTAL AREA

AND STORM ISOHYETAL MAP

NORTH COASTAL AREA
STREAM GAGING STATIONS
(CONTINUED)

- 1 Middle Fork Smith River at Gasquet
- 2 Smith River near Crescent City
- 3 Shasta River near Yreka
- 4 Scott River near Fort Jones
- 5 Klamath River near Siskiyou Valley
- 6 South Fork Salmon River near Forks of Salmon
- 7 North Fork Salmon River near Forks of Salmon
- 8 Salmon River at Sooesbar
- 9 Klamath River at Sooesbar
- 10 Red Cap Creek near Orleans
- 11 Bluff Creek near Weitchpec
- 12 Trinity River above Collier Creek near
Trinity Center

- 13 Trinity River of Lewiston
- 14 North Fork Trinity River at Helela
- 15 Trinity River near Burnt Ranch
- 16 New River at Denny
- 17 South Fork Trinity River at Forest Glenn
- 18 South Fork Trinity River near Hyampom
- 19 Haylock Creek near Haylock
- 20 Haylock Creek near Hyampom
- 21 South Fork Trinity River near Salyer
- 22 Willow Creek at Willow Creek
- 23 Trinity River near Hoopa
- 24 Klamath River near Klamath
- 25 Redwood Creek at Orick

- 21 Crescent City Maintenance Station
- 22 Happy Camp Ranger Station
- 23 Klamath
- 24 Etna
- 25 Hoopa
- 26 Collee Creek Ranger Station
- 27 Eureka WB City
- 28 Kneeland 10 SSE
- 29 Hyampom
- 30 Miranda Spengler Ranch
- 31 Lake Mountain
- 32 Covelo Eel River Ranger Station
- 33 Laytonville
- 34 Fort Bragg
- 35 Willits Howard Forest Ranger Station
- 36 Redwood Valley
- 37 Navarro 1 NW
- 38 Point Arena
- 39 The Geysia
- 40 Venado

- 27 Mad River above Forest Glen
- 28 North Fork Mad River near Korbel
- 29 Mad River near Arcola
- 30 Jacoby Creek near Freshwater
- 31 El River near Fall
- 32 El River below Scott Dale near Potter Valley
- 33 El River at Van Anden Dam, near Potter Valley
- 34 Outlet Creek near Longvale
- 35 El River above Dor
- 36 Black Butte River near Covelo
- 37 Middle Fork El River below Black Butte River near Covelo
- 38 El River below Dos Rios
- 39 North Fork El River near Mina
- 40 El River at Aldemore
- 41 South Fork El River near Bannacomb
- 42 Temmie Creek near Laytonville
- 43 South Fork El River near Miranda
- 44 Bull Creek near Heolt
- 45 Longlake Creek near Holmes
- 46 El River at Scotia

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HIGH WATER OF 1964-65
DECEMBER 1964 STORM

NORTH COASTAL AREA
STATION LOCATION AND STORM ISOHYETAL MAP

LEGEND

- ▲ STREAM GAGING STATION
● HOURLY PRECIPITATION STATION
— DRAINAGE BASIN BOUNDARY
— 5 — ISOHYETS OF RAINFALL IN INCHES
FOR THE PERIOD DEC. 18 - 24, 1964

S T A L

STATE OF CALIFORNIA
THE RESOURCES AGENCY
ARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE
HIGH WATER OF 1964-65
CEMBER 1964 STORM

FRANCISCO BAY AREA
TION AND STORM ISOHYETAL MAP

LEGEND

- ▲ STREAM GAGING STATION
● HOURLY PRECIPITATION STATION
— DRAINAGE BASIN BOUNDARY
— 5 — ISOHYETS OF RAINFALL IN INCHES
FOR THE PERIOD DEC. 18 - 24, 1964

S T A L

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE
HIGH WATER OF 1964-65
DECEMBER 1964 STORM

FRANCISCO BAY AREA
FLOODING AND STORM ISOHYETAL MAP

**SAN FRANCISCO BAY AREA
STREAM GAGING STATIONS**





1. Walker Creek near Tomales
2. Corte Madera Creek at Ross
3. Novato Creek near Novato
4. Sonoma Creek at Boyes Hot Springs
5. Napa River near St. Helena
6. Dry Creek near Napa
7. Napa River near Napa
8. Redwood Creek near Napa
9. San Ramon Creek at San Ramon
10. San Ramon Creek at Walnut Creek
11. Walnut Creek at Walnut Creek
12. San Lorenzo Creek at Hayward
13. Arroyo Mocho near Pleasanton
14. Arroyo Valle near Livermore
15. Arroyo Valle at Pleasanton
16. Alameda Creek near Niles
17. Patterson Creek at Union City
18. Alameda Creek at Union City
19. Coyote Creek near Madrone
20. Upper Penitencia Creek at San Jose
21. Alameda Creek near New Almaden
22. Los Gatos Creek at Los Gatos
23. Guadalupe River at San Jose
24. Saratoga Creek at Saratoga
25. Matadero Creek at Palo Alto
26. San Francisco Creek at Stanford University
27. Redwood Creek at Redwood City
28. Pescadero Creek near Pescadero

**SAN FRANCISCO BAY AREA
HOURLY PRECIPITATION STATIONS**

1. St. Helena 4 WSW
2. Petaluma 1 N
3. Novato 8 WNW
4. Mount Tamalpais 2 SW
5. Martinez 3 S
6. Walnut Creek 2 ENE
7. Oakland WB AP
8. San Francisco FOB
9. San Francisco WB AP
10. SE Farellon
11. Hayward 6 ESE
12. Palo Alto City Hall
13. San Jose
14. Morgan Hill 6 WNW



LEGEND

-  STREAM GAGING STATION
-  HOURLY PRECIPITATION STATION
-  DRAINAGE BASIN BOUNDARY
-  ISOHYETS OF RAINFALL IN INCHES
FOR THE PERIOD DEC. 18 - 24, 1964

TH
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AREA





+34°
119°

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
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HIGH WATER OF 1964-65
DECEMBER 1964 STORM

CENTRAL COASTAL AREA
ON LOCATION AND STORM ISOHYETAL MAP

LEGEND

-  STREAM GAGING STATION
-  HOURLY PRECIPITATION STATION
-  DRAINAGE BASIN BOUNDARY
-  ISOHYETS OF RAINFALL IN INCHES
FOR THE PERIOD DEC. 18 - 24, 1964

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STAL
AREA

+34°
119°

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DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE

HIGH WATER OF 1964-65
DECEMBER 1964 STORM

CENTRAL COASTAL AREA
ON LOCATION AND STORM ISOHYETAL MAP

CENTRAL COASTAL AREA
STREAM GAGING STATIONS

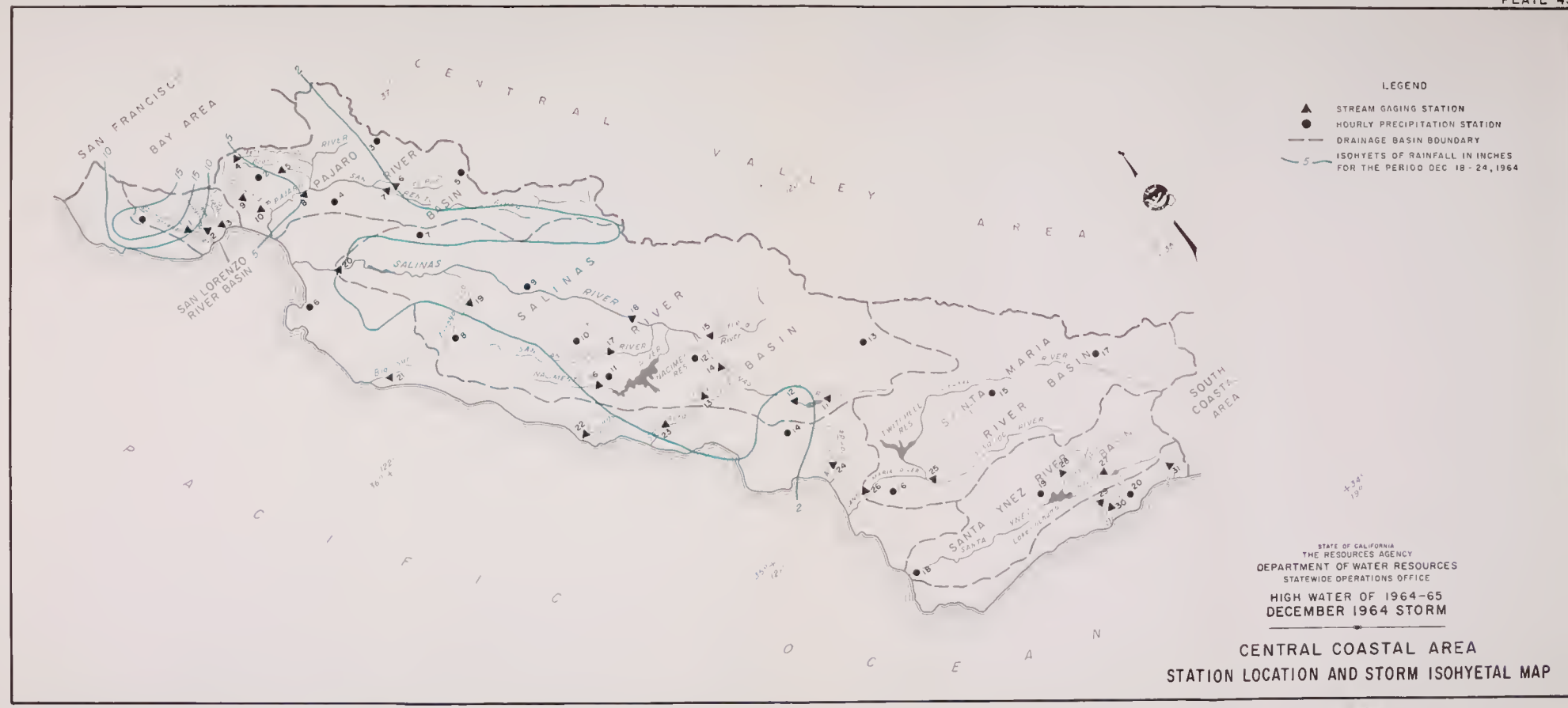
- 1 San Lorenzo River at Big Trees
- 2 Branciforte Creek at Santa Cruz
- 3 Sequel Creek at Sequel
- 4 Lilagas Creek near Morgan Hill
- 5 Blodfish Creek near Gilroy
- 6 Tres Pinos Creek near Tres Pinos
- 7 San Benito River near Hollister
- 8 Pajaro River at Chittenden
- 9 Corralitos Creek near Corralitos
- 10 Corralitos Creek at Freedom
- 11 Salinas River near Pozo
- 12 Salinas River above Pitas Creek near Santa Margarita
- 13 Jack Creek near Templeton
- 14 Salinas River at Paso Robles
- 15 Estrella River near Estrella
- 16 Nacimiento River near Bryan
- 17 San Antonio River at Playto
- 18 Salinas River near Bradley
- 19 Arroyo Seco near Soledad
- 20 Salinas River near Spreckels
- 21 Big Sur River near Big Sur
- 22 Arroyo De La Cruz near San Simeon
- 23 Santa Rosa Creek near Cambria
- 24 Arroyo Grande at Arroyo Grande
- 25 Slough River near Gentry
- 26 Santa Maria River at Guadalupe
- 27 Santa Ynez River below Gibraltar Dam near Santa Barbara
- 28 Santa Cruz Creek near Santa Ynez
- 29 San Jose Creek near Goleta

CENTRAL COASTAL AREA
STREAM GAGING STATIONS
(CONTINUED)

- 30 Atascadero Creek near Goleta
- 31 Carpinteria Creek near Carpinteria

CENTRAL COASTAL AREA
HOURLY PRECIPITATION STATIONS

- 1 Boulder Creek Lucatelli Ranch
- 2 Mount Madonna
- 3 Hollister 10 ENE
- 4 San Juan Bautista
- 5 Upper Tres Pinos
- 6 Del Monte
- 7 Gonzales 9 ENE
- 8 Arroyo Seco
- 9 King City
- 10 Lockwood 2 N
- 11 Bryson
- 12 Paso Robles 5 NW
- 13 La Panza Ranch
- 14 San Luis Obispo Cal Poly
- 15 Cuyama Ranch
- 16 Santa Maria WB AP
- 17 Cuyama Ranger Station
- 18 Point Arguello
- 19 Calhum Dam
- 20 Santa Barbara



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STATEWIDE OPERATIONS OFFICE

HIGH WATER OF 1964-65
DECEMBER 1964 STORM

1. Sacramento River at
2. North Fork Pit River
3. Pit River near Biebe
4. Pit River below Pit
5. Pit River near Mont
6. Squaw Creek above
7. McCloud River above
8. Sacramento River at
9. Clear Creek at Fren
10. Clear Creek near Ig
11. Cow Creek near Mill
12. Cottonwood Creek ne
13. Battle Creek below
Hatchery near Cote
14. Paynes Creek near
15. Sacramento River ne
16. Sacramento River at
17. Red Bank Creek nea
18. Antelope Creek nea
19. Elder Creek near Pa
20. Elder Creek at Gerbe
21. Mill Creek near Los
22. Thomes Creek at Pa
23. Deer Creek near Vin
24. Sacramento River at
25. Sacramento River at
26. Big Chico Creek nea
27. Stony Creek near Fri
28. Stony Creek near Ha
29. Sacramento River at
30. Sacramento River at
31. Moulton Weir Spill to
32. Colusa Weir Spill to
33. Sacramento River at
34. Colusa Basin Drain
35. Butte Creek near Ch
36. Butte Slough to Sutte
Bridge
37. Sutter Bypass at Low
38. Tisdale Weir Spill to
39. Sacramento River at
40. Big Grizzley Creek
41. Middle Fork Feather
42. Middle Fork Feather
43. South Fork Feather
44. Feather River at Bid
45. North Fork Feather
46. Indian Creek near C
47. Spanish Creek above
at Keddie
48. North Fork Feather
49. West Branch Feather
50. Feather River at Oro
51. Feather River near C
52. South Honcut Creek
53. Feather River at Yu
54. Middle Yuba River a
55. Oregon Creek near Y
56. North Yuba River be
57. North Yuba River be
58. South Yuba River ne
59. South Yuba River at
60. Yuba River at Engle
61. Deer Creek near Sm
62. Yuba River near Ma
63. Bear River near Aub
64. Bear River near Wh
65. Feather River at Nu
66. Sacramento River at
67. Sacramento River at
68. Sacramento Weir Sp
- near Sacramento
69. North Fork America
Fork Dam
70. Rubicon River near

1. Sacramento River at
2. North Fork Pit River
3. Pit River near Biebe
4. Pit River below Pit
5. Pit River near Mont
6. Squaw Creek above
7. McCloud River above
8. Sacramento River at
9. Clear Creek at Fren
10. Clear Creek near Igo
11. Cow Creek near Mill
12. Cottonwood Creek ne
13. Battle Creek below C
Hatchery near Cote
14. Paynes Creek near R
15. Sacramento River ne
16. Sacramento River at
17. Red Bank Creek near
18. Antelope Creek near
19. Elder Creek near Pa
20. Elder Creek at Gerb
21. Mill Creek near Los
22. Thomes Creek at Pa
23. Deer Creek near Vin
24. Sacramento River at
25. Sacramento River at
26. Big Chico Creek ne
27. Stony Creek near Fr
28. Stony Creek near Ha
29. Sacramento River at
30. Sacramento River at
31. Moulton Weir Spill to
32. Colusa Weir Spill to
33. Sacramento River at
34. Colusa Basin Drain
35. Butte Creek near Ch
36. Butte Slough to Sutt
Bridge
37. Sutter Bypass at Lo
38. Tisdale Weir Spill to
39. Sacramento River at
40. Big Grizzley Creek
41. Middle Fork Feather
42. Middle Fork Feather
43. South Fork Feather
44. Feather River at Bid
45. North Fork Feather
46. Indian Creek near C
47. Spanish Creek above
at Keddie
48. North Fork Feather
49. West Branch Feather
50. Feather River at Oro
51. Feather River near
52. South Honcut Creek
53. Feather River at Yu
54. Middle Yuba River a
55. Oregon Creek near
56. North Yuba River be
57. North Yuba River be
58. South Yuba River ne
59. South Yuba River at
60. Yuba River at Engle
61. Deer Creek near Sm
62. Yuba River near Ma
63. Bear River near Aub
64. Bear River near Whe
65. Feather River at Ni
66. Sacramento River at
67. Sacramento River at
68. Sacramento Weir Spi
near Sacramento
69. North Fork America
Fork Dam
70. Rubicon River near

LEGEND



STREAM GAGING STATION



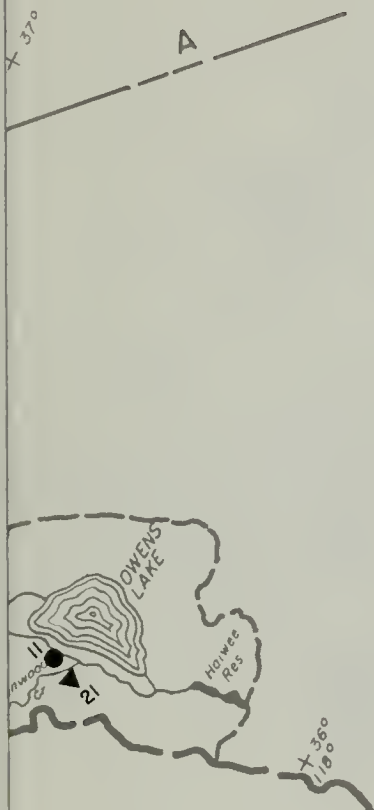
HOURLY PRECIPITATION STATION



DRAINAGE BASIN BOUNDARY



ISOHYETS OF RAINFALL IN INCHES
FOR THE PERIOD DEC. 18-24, 1964



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE

HIGH WATER OF 1964-65
DECEMBER 1964 STORM

NORTHERN LAHONTAN AREA

STATION LOCATION AND STORM ISOHYETAL MAP

LEGEND



STREAM GAGING STATION



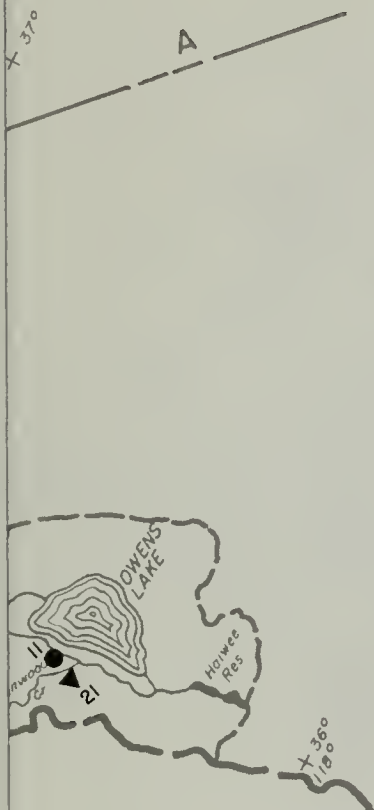
HOURLY PRECIPITATION STATION



DRAINAGE BASIN BOUNDARY



ISOHYETS OF RAINFALL IN INCHES
FOR THE PERIOD DEC. 18-24, 1964



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE

HIGH WATER OF 1964-65
DECEMBER 1964 STORM

NORTHERN LAHONTAN AREA

STATION LOCATION AND STORM ISOHYETAL MAP

NORTHERN LAHONTAN AREA
STREAM GAGING STATIONS

- 1 Bidwell Creek near Mill Creek area
- 2 Bidwell Creek
- 3 Snake Creek near Susanville
- 4 Yellow Creek near Susanville
- 5 Snake River at Susanville
- 6 Upper Truckee River near Nevada
- 7 Little Truckee River near Hobart Mills
- 8 Little Truckee River above Boca Power Co. near Boca
- 9 Truckee River at Gardnerville
- 10 Great Park Canyon River at Gardnerville
- 11 East Park Canyon River below Markleeville Creek near Markleeville
- 12 West Walker River below Little Walker River near Colusa
- 13 West Walker River near Colusa
- 14 Swager's Creek near Bridgeport
- 15 Virginia Creek near Bridgeport
- 16 East Walker River near Bridgeport
- 17 Low Vining Creek near Low Vining
- 18 Rush Creek above Great Lake near Lake
- 19 Rush Creek at Little Round Valley near Bishop
- 20 Big Pine Creek near Big Pine
- 21 Owens River near Big Pine
- 22 Carson River near Elko

NORTHERN LAHONTAN AREA
HOURLY PRECIPITATION GAGES

- 1 Thompson
- 2 Susanville 1 WSW
- 3 Millard Lassen Ranger Station
- 4 Truckee Ranger Station
- 5 Markleeville
- 6 Susanville Junction
- 7 Bridgeport Ranger Station
- 8 Bishop WB AP
- 9 Independence
- 10 Independence Owens Valley
- 11 Lone Pine 1, 11 General Power House

- LEGEND
- ▲ STREAM GAGING STATION
 - HOURLY PRECIPITATION STATION
 - DRAINAGE BASIN BOUNDARY
 - - - ISOHYETS OF RAINFALL IN INCHES FOR THE PERIOD DEC 18-24, 1964



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HIGH WATER OF 1964-65
DECEMBER 1964 STORM

NORTHERN LAHONTAN AREA
STATION LOCATION AND STORM ISOHYETAL MAP

1. Sacramento
2. North Fork
3. Pit River ne
4. Pit River be
5. Pit River ne
6. Squaw Creek
7. McCloud Riv
8. Sacramento
9. Clear Creek
10. Clear Creek
11. Cow Creek n
12. Cottonwood
13. Battle Creek
- Hatchery n
14. Paynes Cree
15. Sacramento
16. Sacramento
17. Red Bank C
18. Antelope Cr
19. Elder Creek
20. Elder Creek
21. Mill Creek n
22. Thomes Cre
23. Deer Creek
24. Sacramento
25. Sacramento
26. Big Chico C
27. Stony Creek
28. Stony Creek
29. Sacramento
30. Sacramento
31. Moulton Wei
32. Colusa Weir
33. Sacramento
34. Colusa Bas
35. Butte Creek
36. Butte Slough
- Bridge
37. Sutter Bypa
38. Tisdale Wei
39. Sacramento
40. Big Grizzle
41. Middle Fork
42. Middle Fork
43. South Fork
44. Feather Riv
45. North Fork
46. Indian Cree
47. Spanish Cre
- at Keddie
48. North Fork
49. West Branc
50. Feather Riv
51. Feather Riv
52. South Honc
53. Feather Riv
54. Middle Yub
55. Oregon Cre
56. North Yuba
57. North Yuba
58. South Yuba
59. South Yuba
60. Yuba River
61. Deer Creek
62. Yuba River
63. Bear River
64. Bear River
65. Feather Ri
66. Sacramento
67. Sacramento
68. Sacramento
- near Sacr
69. North Fork
- Fork Dam
70. Rubicon Ri

LEGEND



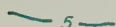
STREAM GAGING STATION



HOURLY PRECIPITATION STATION



DRAINAGE BASIN BOUNDARY

ISOHYETS OF RAINFALL IN INCHES
FOR THE PERIOD JAN. 1-7, 1965

STATE OF CALIFORNIA
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HIGH WATER OF 1964-65
JANUARY 1965 STORM

CENTRAL VALLEY AREA

ON LOCATION AND STORM ISOHYETAL MAP

▲ STREAM GAGING STATION
● HOURLY PRECIPITATION STATION
— — — DRAINAGE BASIN BOUNDARY
— 5 — ISOHYETS OF RAINFALL IN INCHES
FOR THE PERIOD JAN. 1-7, 1965



STATE OF CALIFORNIA
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HIGH WATER OF 1964-65
JANUARY 1965 STORM

CENTRAL VALLEY AREA

ON LOCATION AND STORM ISOHYETAL MAP

CENTRAL VALLEY AREA

STREAM GAGING STATIONS

1. Sacramento River at Delta
2. North Fork Pit River near Ashland
3. Pit River near Barker
4. Pit River below Pit No. 4 Dam
5. Pit River near Montgomery Creek
6. Squaw Creek above Shasta Lake
7. McCloud River above Shasta Lake
8. Sacramento River at Keswick
9. Clear Creek at French Gulch
10. Clear Creek near Igou
11. Clear Creek near Millville
12. Colusa Creek near Colusa
13. Colusa Creek below Colusa Dam
14. Feather River at Colusa
15. Feather River at Red Bluff
16. Feather River at Red Bluff
17. Feather River at Red Bluff
18. Feather River at Red Bluff
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70. Feather River at Red Bluff

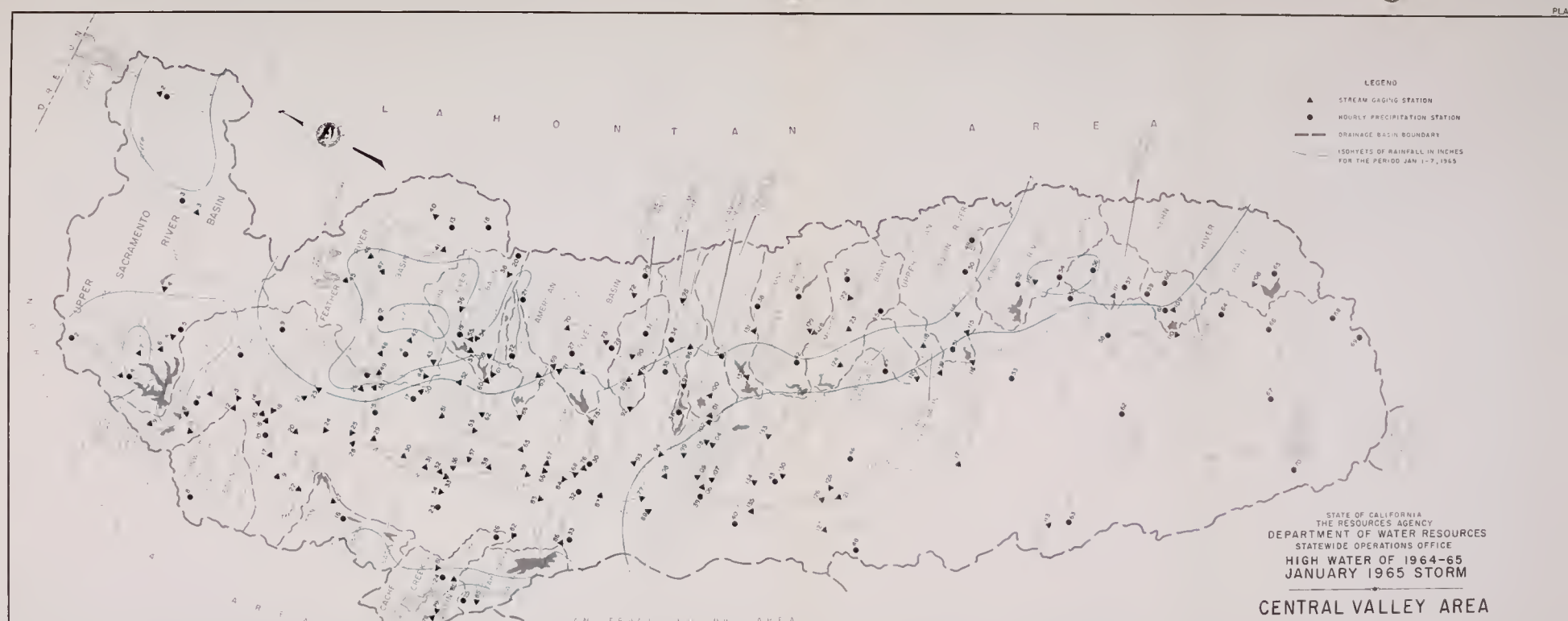
CENTRAL VALLEY AREA

HOURLY PRECIPITATION STATION

1. Alluvial River Station
2. Mount Shasta WB City
3. Bishop
4. Volcano
5. Round Mountain HNE
6. Redding 1 SE
7. Valley River House
8. Hamilton Branch Pioneer House
9. Mount
10. Red Bluff WB AP
11. Delta
12. Shasta Lake
13. Paradise
14. Shasta Creek Ranger Station
15. Churn Experiment Station
16. Shasta Gauge Downstream
17. Donnell Ranger Station
18. Siskiyou Ranger Station
19. Camanche Ranger Station
20. Siskiyou 1 E
21. Blue Canyon WB AP
22. Gracia Valley
23. Williams
24. Clear Lake Highlands
25. Shasta River
26. Shasta 1 Indian Ranch
27. Georgetown
28. Mount Shasta
29. Shasta Shoshone
30. Sacramento WB City
31. Graceland State
32. Folsom Lake Ranch
33. Lake Shasta
34. Upper River House
35. Park Grove
36. Camp Pardee
37. Colusa Ranger Station
38. Long Ham Experiment Station
39. Shasta Dam
40. Tracy 2 SE
41. Hatch Ranch
42. Graceland 2
43. Graceland 3
44. Yosemite National Park
45. Warner Ranger Station
46. Nevada 2
47. Colusa Dam
48. Pacheco Pass
49. Folsom Lake
50. Hamilton Lake
51. San Joaquin Experiment Range
52. Bear River House
53. Fresno WB AP
54. Grant City
55. Budget
56. Grant Forest
57. Three Rivers SE
58. Grant Forest Ranch
59. Mile 5 NE
60. Springville 1 SE
61. Springville Ranger Station
62. Crocker Irrigation District
63. Crocker 1 SE
64. Colusa 1 SE
65. Colusa 2 SE
66. Lost Hills
67. Siskiyou WB AP
68. Loma
69. Truckee Ranger Station
70. Tall

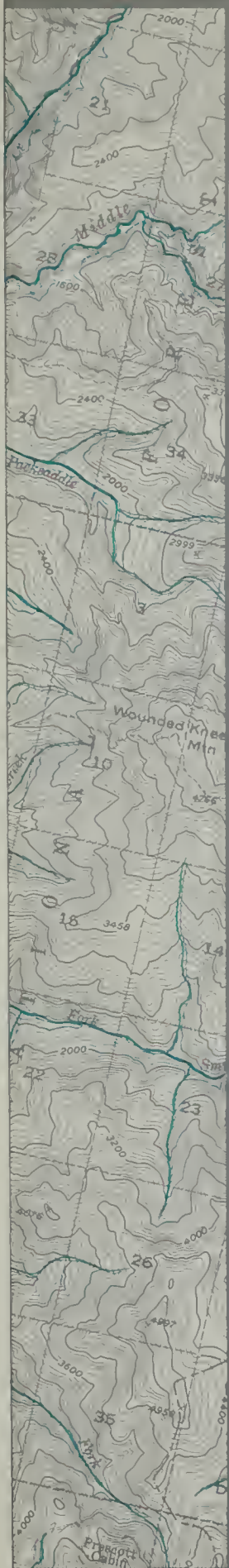
LEGEND

- ▲ STREAM GAGING STATION
- HOURLY PRECIPITATION STATION
- DRAINAGE BASIN BOUNDARY
- ISOHYETS OF RAINFALL IN INCHES FOR THE PERIOD JAN 1-7, 1965



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JANUARY 1965 STORM

CENTRAL VALLEY AREA
STATION LOCATION AND STORM ISOHYETAL MAP



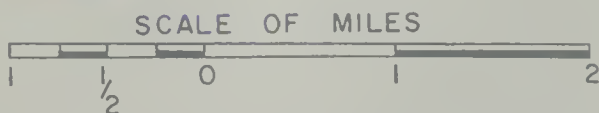
LOCATION
MAP

LEGEND

① - Smith River nr. Gasquet
Stream Gaging Station



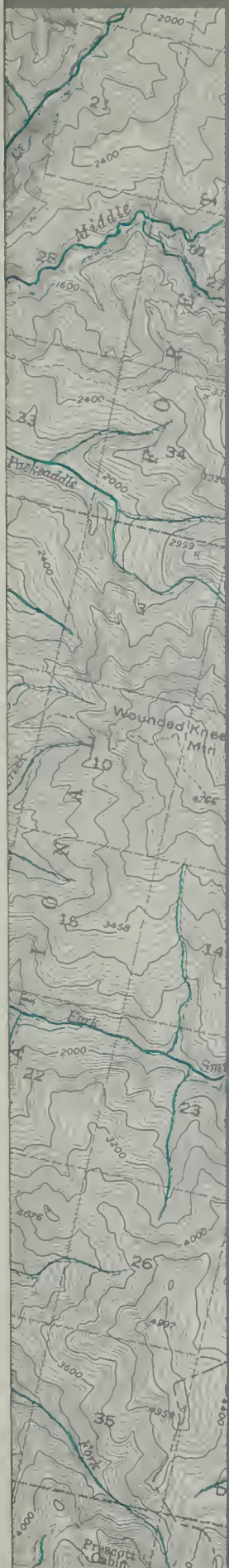
FLOODED AREA



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE



FLOOD OF DECEMBER 1964
FLOODED AREAS
SMITH RIVER - GASQUET



LOCATION MAP

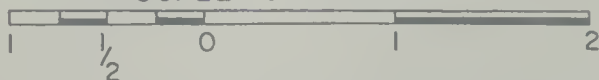
LEGEND

① - Smith River nr. Gasquet
Stream Gaging Station



FLOODED AREA

SCALE OF MILES



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE



FLOOD OF DECEMBER 1964
FLOODED AREAS
SMITH RIVER - GASQUET



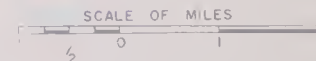
LOCATION
MAP

LEGEND

① - Smith River nr Gasquet
Stream Gaging Station



FLOODED AREA



SCALE OF MILES

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE

FLOOD OF DECEMBER 1964
FLOODED AREAS
SMITH RIVER - GASQUET



LOCATION MAP

LEGEND

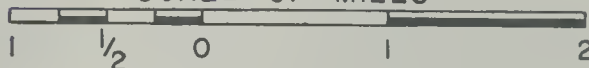


Smith River Near Crescent
City Stream Gaging Sta.



FLOODED AREAS

SCALE OF MILES



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE



FLOOD OF DECEMBER 1964

FLOODED AREAS

SMITH RIVER — DELTA



LOCATION MAP

LEGEND

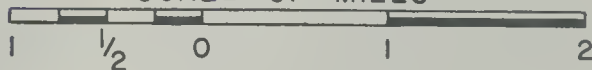


Smith River Near Crescent
City Stream Gaging Sta.



FLOODED AREAS

SCALE OF MILES



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE



FLOOD OF DECEMBER 1964

FLOODED AREAS


SMITH RIVER — DELTA

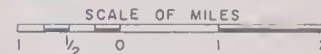


LOCATION
MAP

LEGEND

- ① Smith River Near Crescent
City Stream Gaging Sta.

 FLOODED AREAS

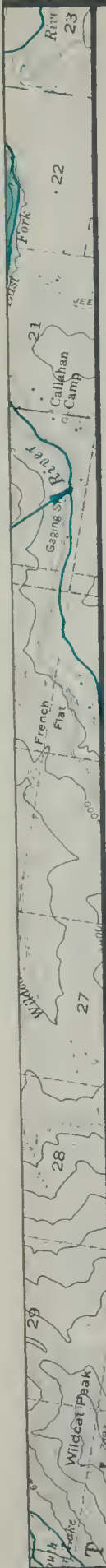


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DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE

FLOOD OF DECEMBER 1964

FLOODED AREAS

SMITH RIVER—DELTA



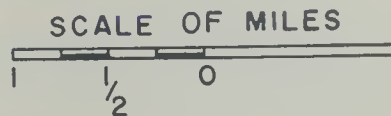
LOCATION MAP

LEGEND

- ① Scott River nr. Ft. Jones
Stream Gaging Station
- ② East Fork Scott River at
Callahan Stream Gaging Sta.
- ③ South Fork Scott River Near
Callahan Stream Gaging Sta.



FLOODED AREA



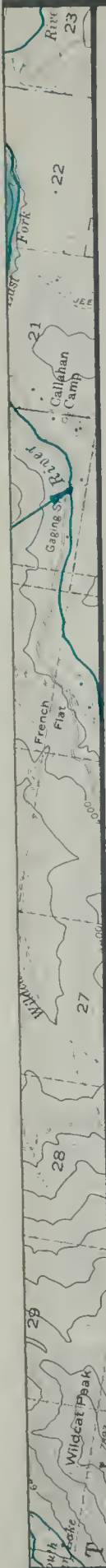
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THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE



FLOOD OF DECEMBER 1964

FLOODED AREAS

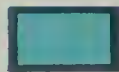
SCOTT RIVER



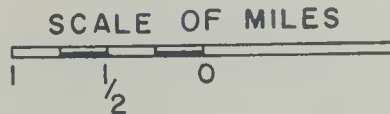
LOCATION MAP

LEGEND

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Stream Gaging Station
- ② East Fork Scott River at
Callahan Stream Gaging Sta.
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Callahan Stream Gaging Sta.



FLOODED AREA



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FLOOD OF DECEMBER 1964

FLOODED AREAS

SCOTT RIVER

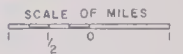


LOCATION
MAP

LEGEND

- ① Scott River nr Ft Jones
Stream Gaging Station
- ② East Fork Scott River at
Callahan Stream Gaging Sta
- ③ South Fork Scott River Near
Callahan Stream Gaging Sta

 FLOODED AREA



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
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FLOOD OF DECEMBER 1964

FLOODED AREAS
SCOTT RIVER



LOCATION
MAP

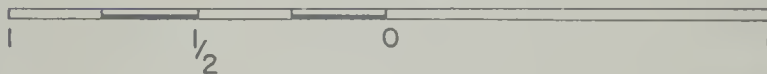
LEGEND

- ① - Trinity River near Hoopa
Stream Gaging Station
- ② - Bridge Partially Destroyed



FLOODED AREA

SCALE OF MILES



STATE OF CALIFORNIA
THE RESOURCES AGENCY
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FLOOD OF DECEMBER 1964
FLOODED AREAS
TRINITY RIVER
HOOPA — WILLOW CREEK



LOCATION
MAP

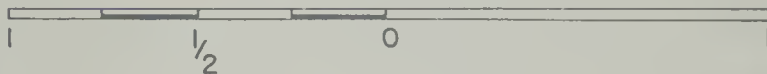
LEGEND

- ① - Trinity River near Hoopa
Stream Gaging Station
- ② - Bridge Partially Destroyed



FLOODED AREA

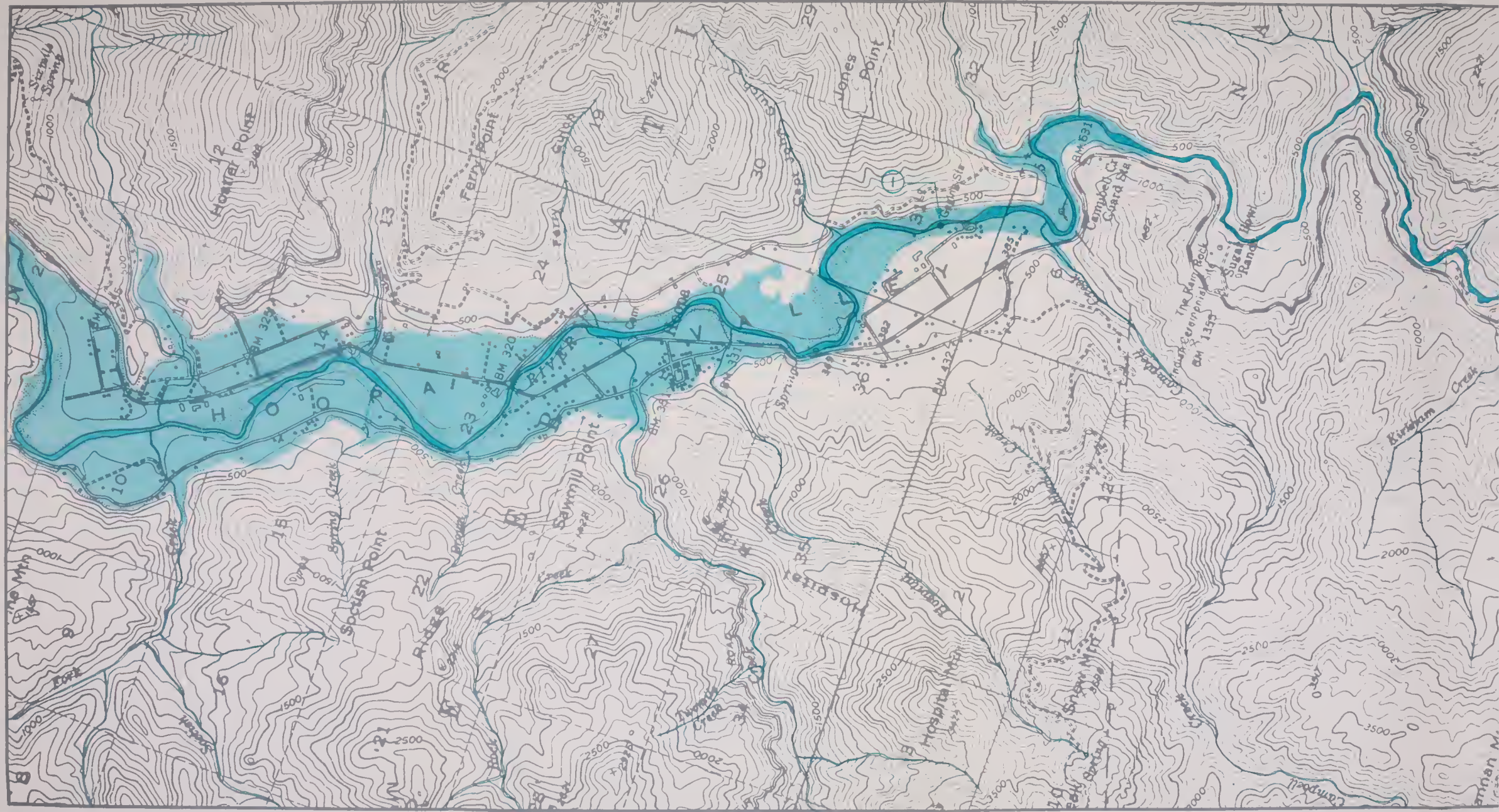
SCALE OF MILES

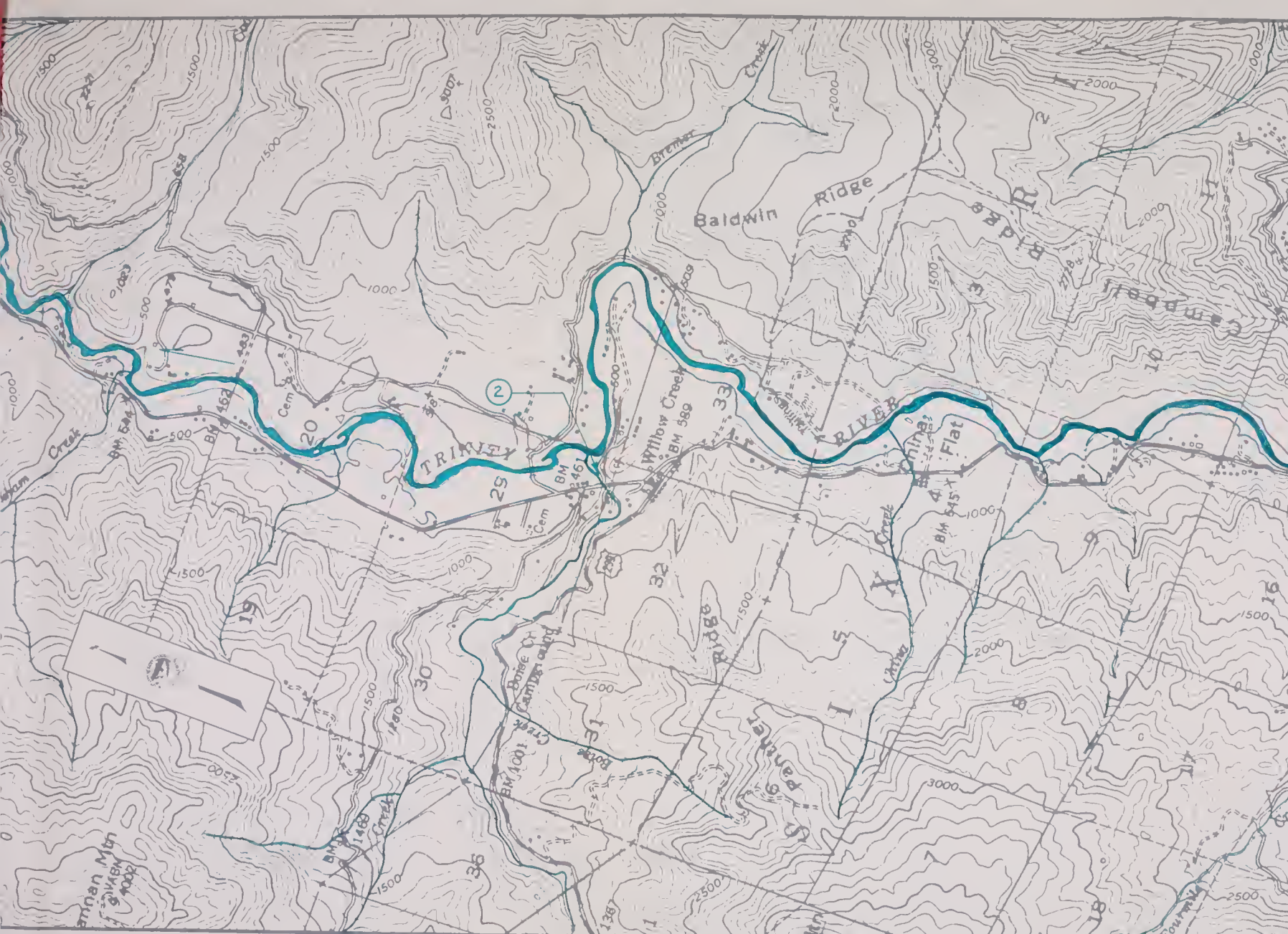


STATE OF CALIFORNIA
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DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATION OFFICE



FLOOD OF DECEMBER 1964
FLOODED AREAS
TRINITY RIVER
HOOPA — WILLOW CREEK





LOCATION
MAP

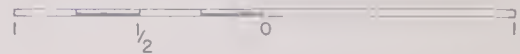
LEGEND

- ① - Trinity River near Hoopa
Stream Gaging Station
- ② - Bridge Partially Destroyed



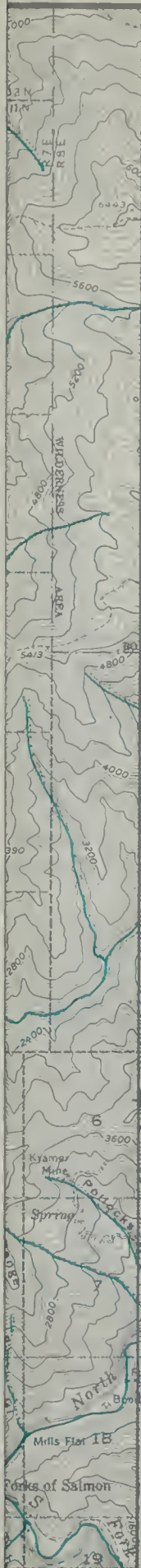
FLOODED AREA

SCALE OF MILES



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FLOOD OF DECEMBER 1964
FLOODED AREAS
TRINITY RIVER
HOOPA — WILLOW CREEK



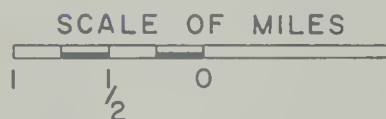
LOCATION
MAP

LEGEND

- ① Klamath River nr. Somesbar Stream Gaging Station
- ② Salmon River nr. Somesbar Stream Gaging Station
- ③ Lewis Creek Slide



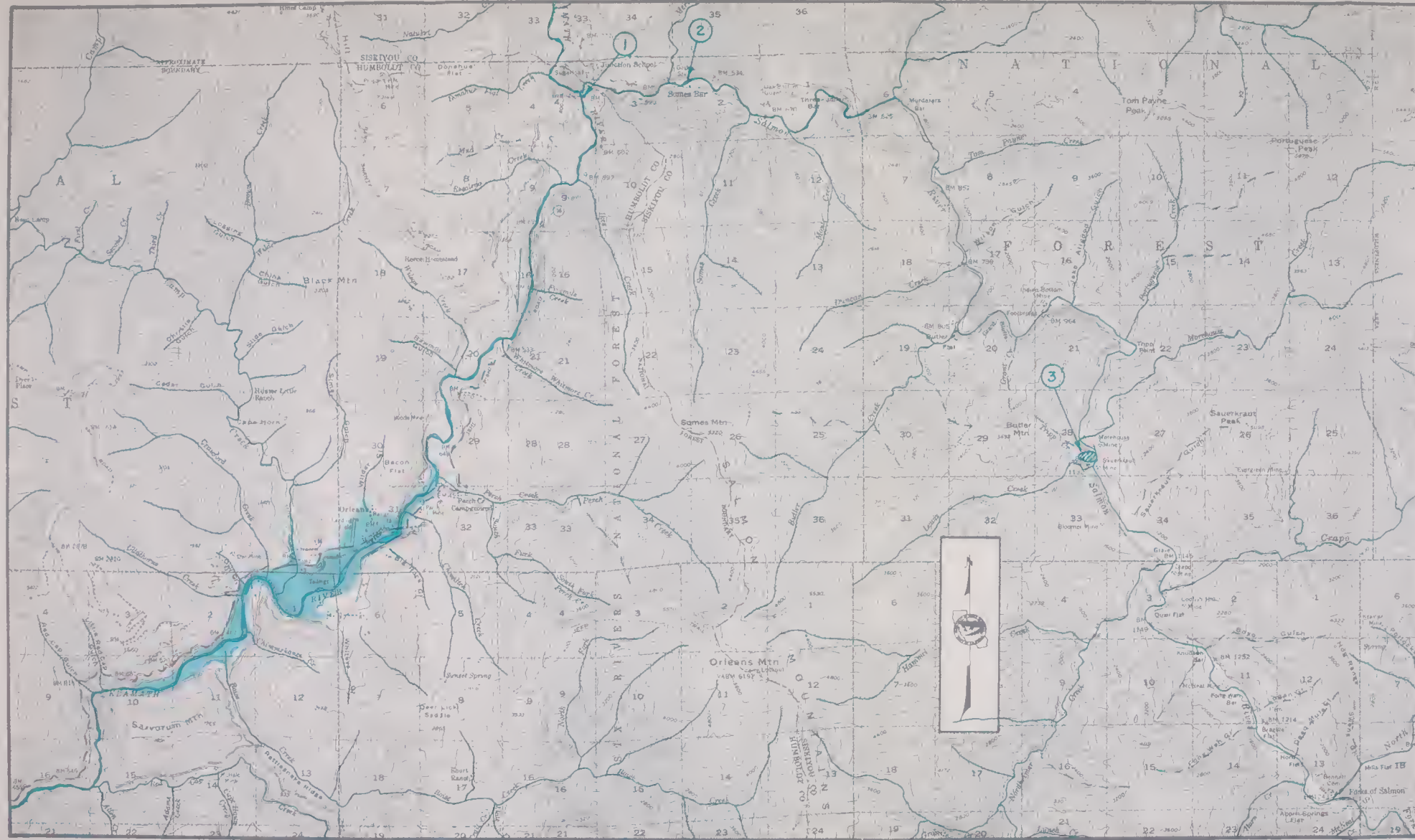
FLOODED AREA



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FLOOD OF DECEMBER 1964
FLOODED AREAS
KLAMATH RIVER - ORLEANS



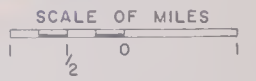
LOCATION
MAP

LEGEND

- ① Klamath River nr. Somesbar Stream Gaging Station
- ② Salmon River nr. Somesbar Stream Gaging Station
- ③ Lewis Creek Slide



FLOODED AREA



STATE OF CALIFORNIA
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FLOOD OF DECEMBER 1964
FLOODED AREAS
KLAMATH RIVER - ORLEANS



LOCATION
MAP

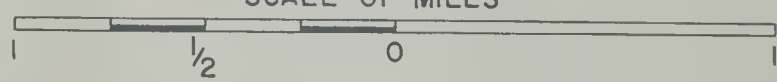
LEGEND

① -Klamath at Klamath Glen
Stream Gaging Station



FLOODED AREA

SCALE OF MILES



STATE OF CALIFORNIA
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DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE



FLOOD OF DECEMBER 1964

FLOODED AREAS
KLAMATH RIVER



LOCATION
MAP

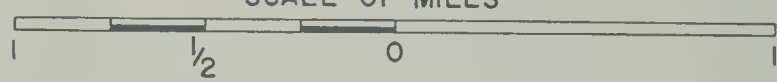
LEGEND

① -Klamath at Klamath Glen
Stream Gaging Station



FLOODED AREA

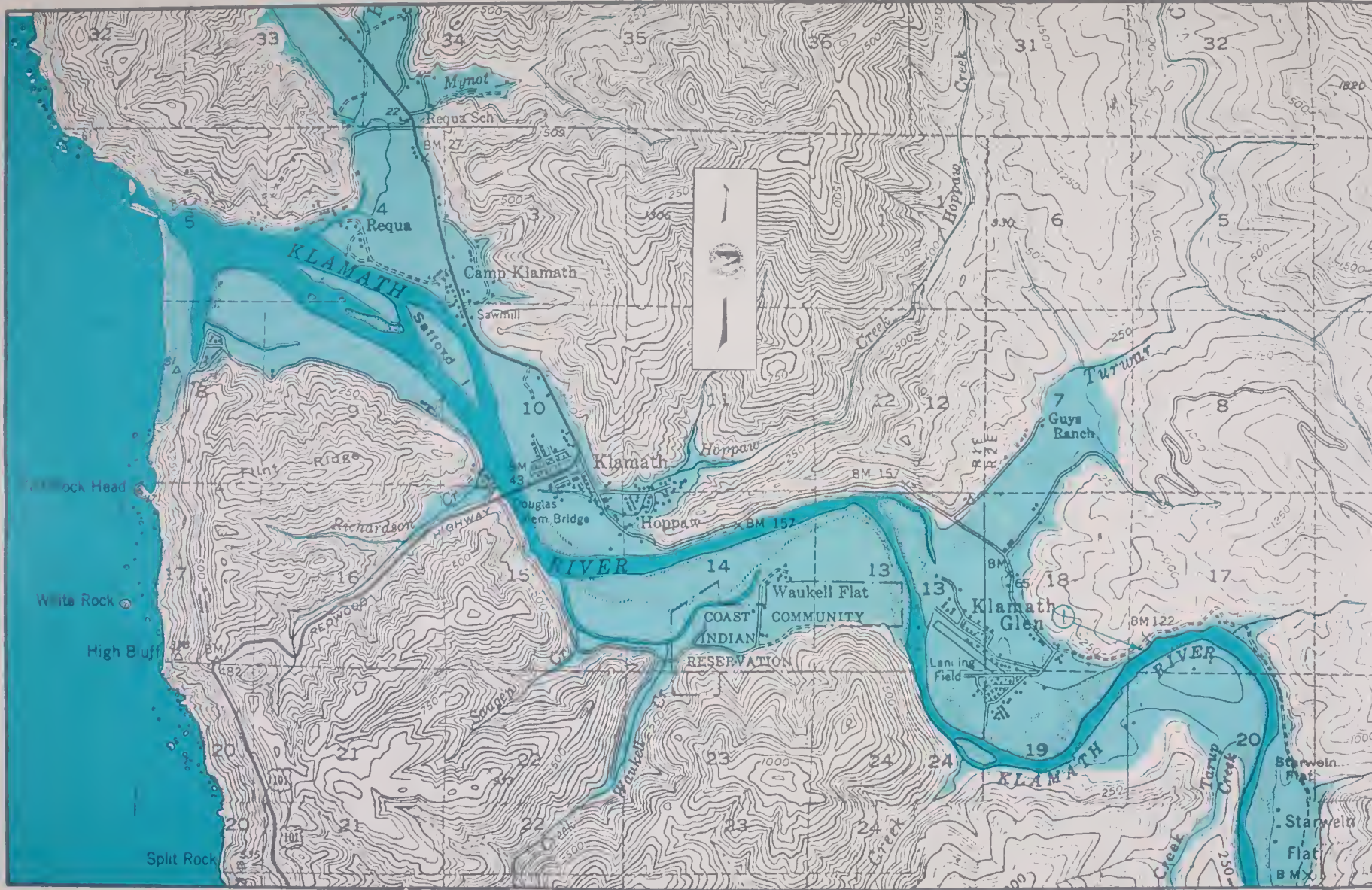
SCALE OF MILES



STATE OF CALIFORNIA
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STATEWIDE OPERATIONS OFFICE



FLOOD OF DECEMBER 1964
FLOODED AREAS
KLAMATH RIVER

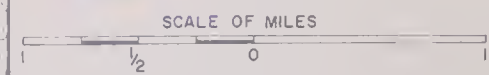


LOCATION
MAP

LEGEND

① -Klamath at Klamath Glen
Stream Gaging Station

 FLOODED AREA



STATE OF CALIFORNIA
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DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE

FLOOD OF DECEMBER 1964
FLOODED AREAS
KLAMATH RIVER



LOCATION MAP

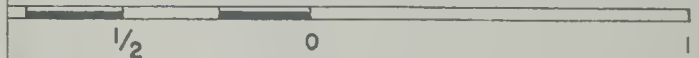
LEGEND

① - Redwood Creek at Orick
Stream Gaging Station



FLOODED AREA

SCALE OF MILES



STATE OF CALIFORNIA
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DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE



FLOOD OF DECEMBER 1964

FLOODED AREAS

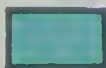
REDWOOD CREEK



LOCATION MAP

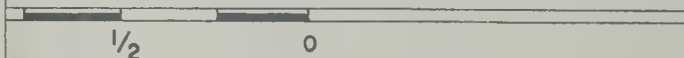
LEGEND

① - Redwood Creek at Orick
Stream Gaging Station



FLOODED AREA

SCALE OF MILES



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE



FLOOD OF DECEMBER 1964

FLOODED AREAS

REDWOOD CREEK



LOCATION
MAP

LEGEND

① - Redwood Creek at Orick
Stream Gaging Station



FLOODED AREA

SCALE OF MILES

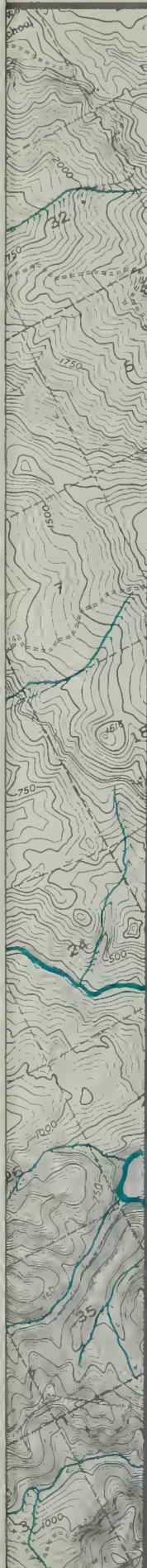


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FLOOD OF DECEMBER 1964

FLOODED AREAS

REDWOOD CREEK



LOCATION
MAP

LEGEND

- ① - Mad River near Arcata Stream Gaging Station
- ② - North Fork of Mad River near Korbel Stream Gaging Station
- ③ - Jacoby Creek near Freshwater Stream Gaging Station



FLOODED AREA



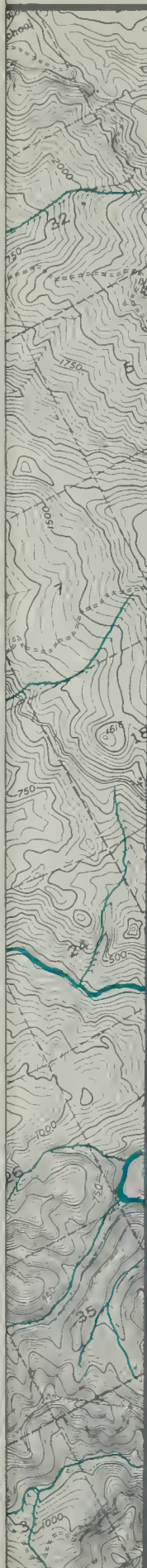
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FLOOD OF DECEMBER 1964

FLOODED AREAS

MAD RIVER



LOCATION
MAP

LEGEND

- ① - Mad River near Arcata Stream Gaging Station
- ② - North Fork of Mad River near Korbel Stream Gaging Station
- ③ - Jacoby Creek near Freshwater Stream Gaging Station



FLOODED AREA

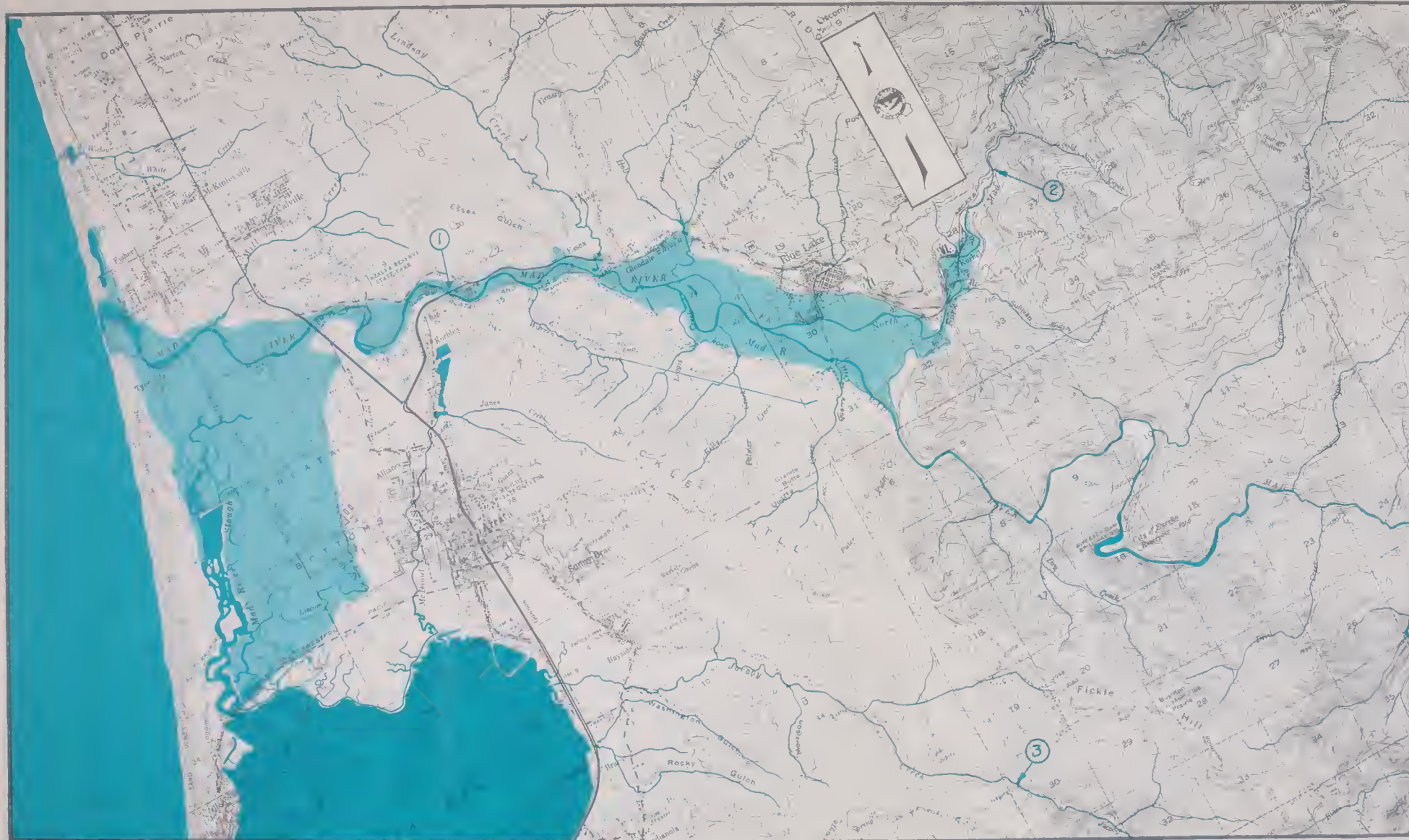


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FLOOD OF DECEMBER 1964

FLOODED AREAS

MAD RIVER



LOCATION
MAP

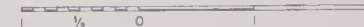
LEGEND

- ① - Mod River near Arcata
Stream Gaging Station
- ② - North Fork of Mad River
near Korb Stream
Gaging Station
- ③ - Jacoby Creek near
Freshwater Stream
Gaging Station



FLOODED AREA

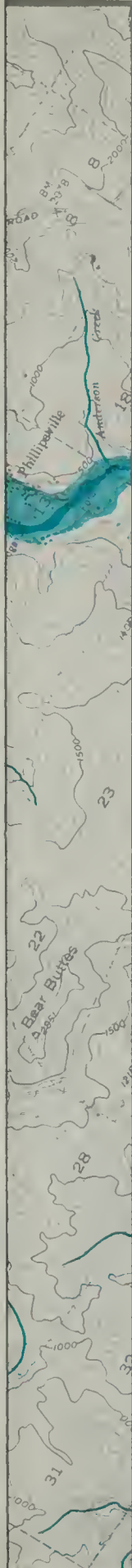
SCALE OF MILES



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FLOOD OF DECEMBER 1964

FLOODED AREAS
MAD RIVER



LOCATION MAP

LEGEND



Eel River at Scotia
Stream Gaging Station



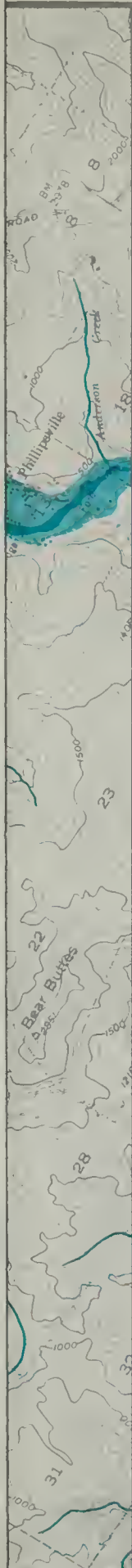
FLOODED AREA



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FLOODED AREAS
EEL RIVER
RIO DELL — PHILLIPPSVILLE



LOCATION MAP

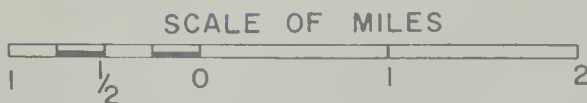
LEGEND



Eel River at Scotia
Stream Gaging Station



FLOODED AREA

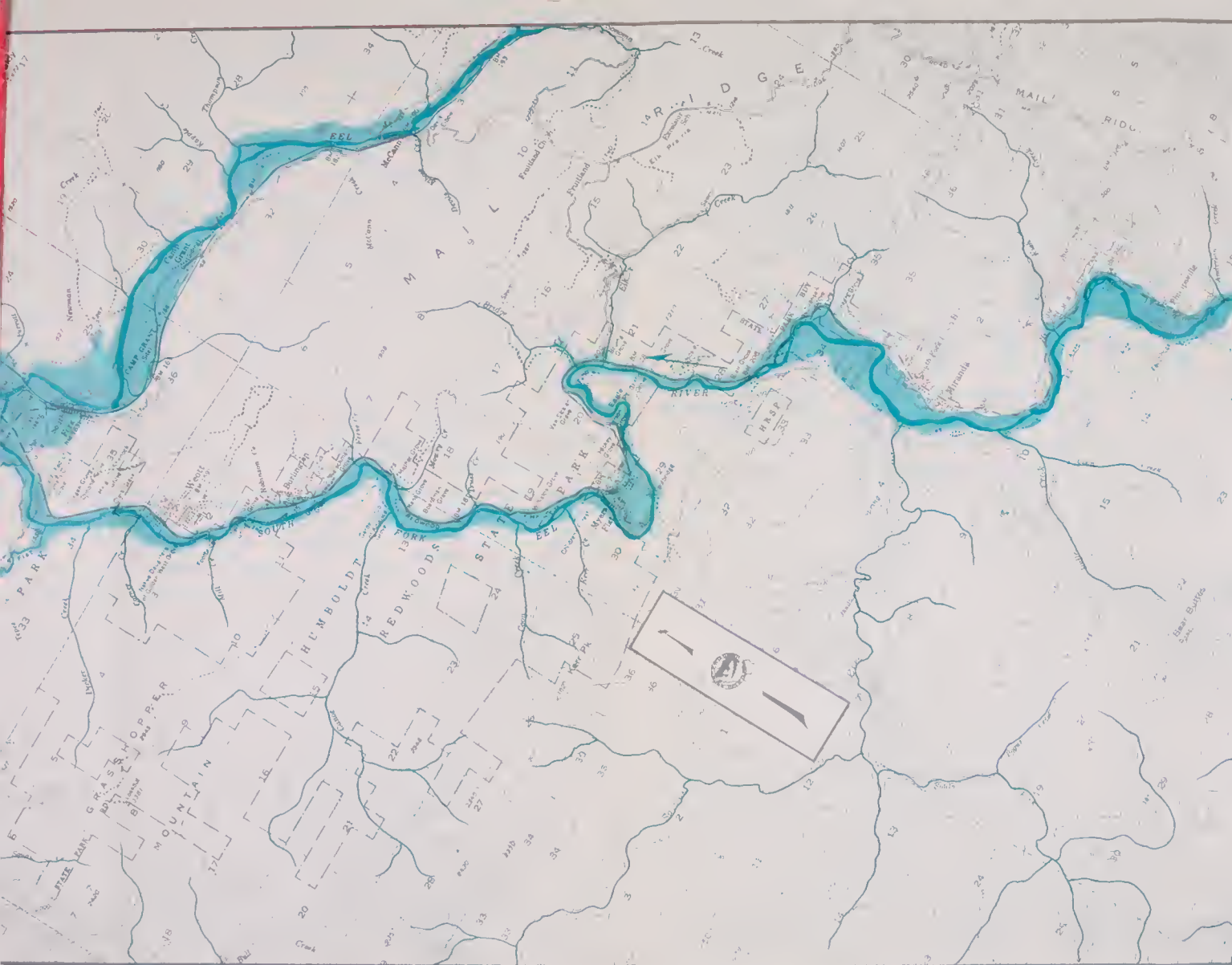


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FLOOD OF DECEMBER 1964
FLOODED AREAS
EEL RIVER
RIO DELL — PHILLIPPSVILLE





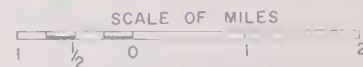
LOCATION
MAP

LEGEND

① Eel River at Scatio
Stream Gaging Station

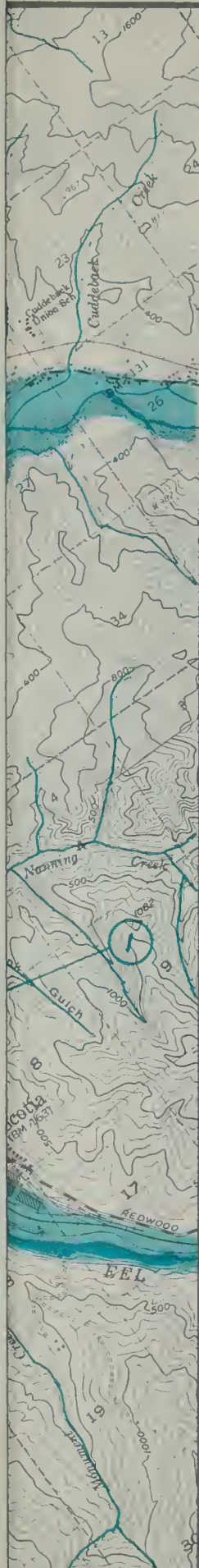


FLOODED AREA



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FLOOD OF DECEMBER 1964
FLOODED AREAS
EEL RIVER
RIO DELL — PHILLIPSVILLE



LOCATION
MAP

LEGEND

- ① - Eel River at Scotia Stream Gaging Station
- ② - Eel River near Fernbridge Stream Gaging Station

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FLOODED AREA

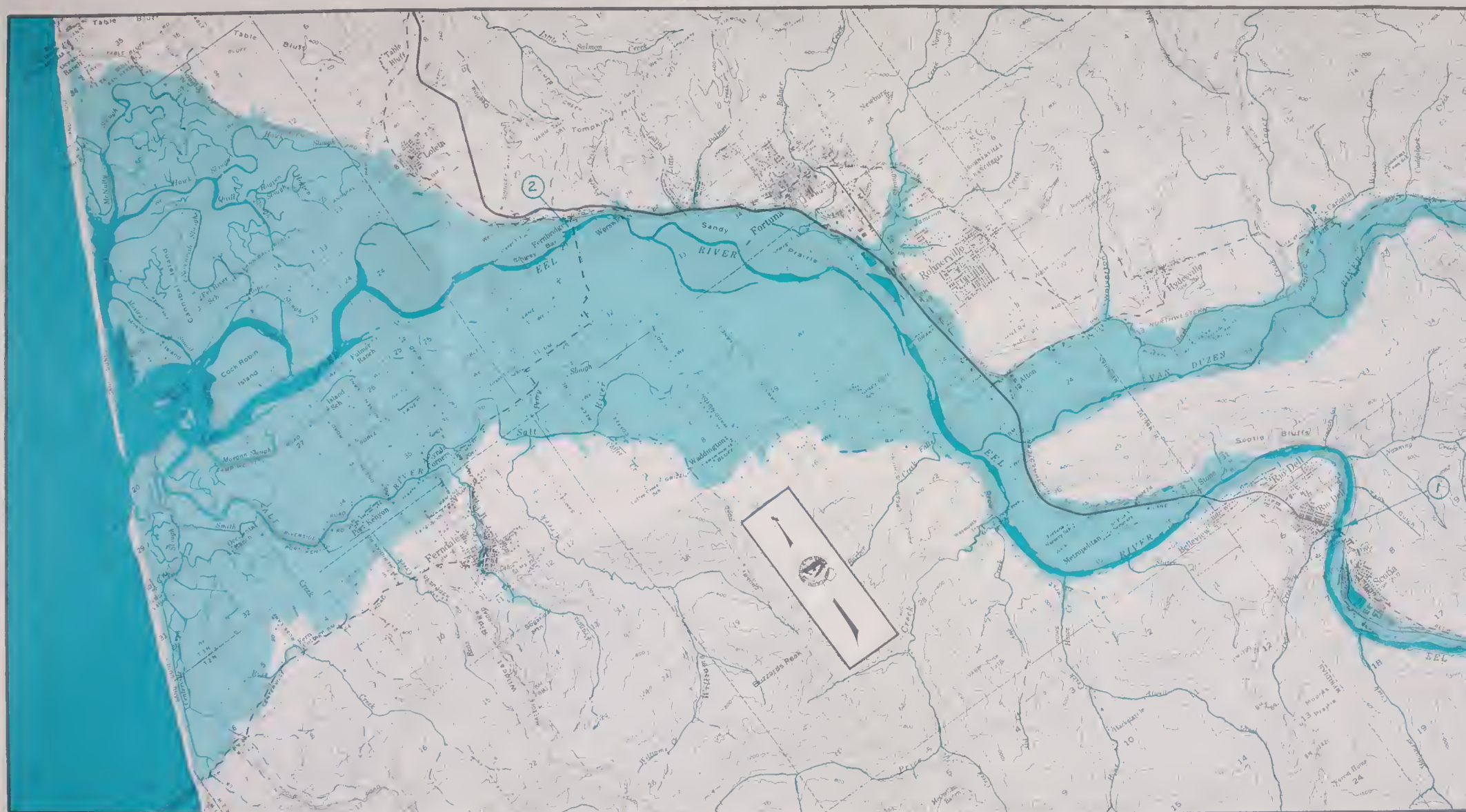
SCALE OF MILES



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FLOOD OF DECEMBER 1964
FLOODED AREAS
EEL RIVER - DELTA



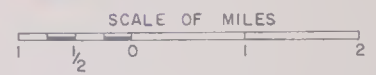
LOCATION
MAP

LEGEND

- ① - Eel River at Scotia Stream Gaging Station
- ② - Eel River near Fernbridge Stream Gaging Station

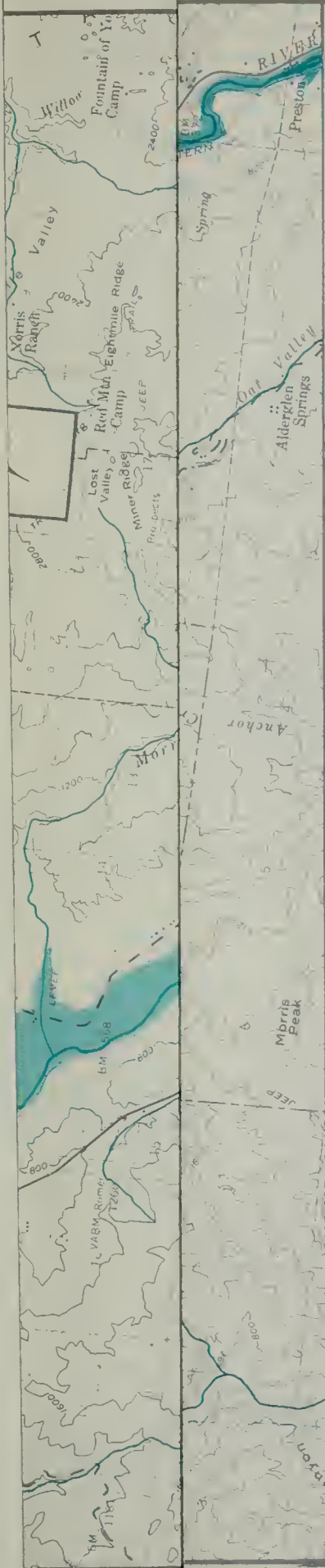


FLOODED AREA



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FLOOD OF DECEMBER 1964
FLOODED AREAS
EEL RIVER - DELTA



LOCATION MAP

LEGEND

Stream Gaging Stations

- ① E. Fk. Russian River nr. Ukiah
- ② Russian River nr. Ukiah
- ③ Russian River nr. Hopland



FLOODED AREA

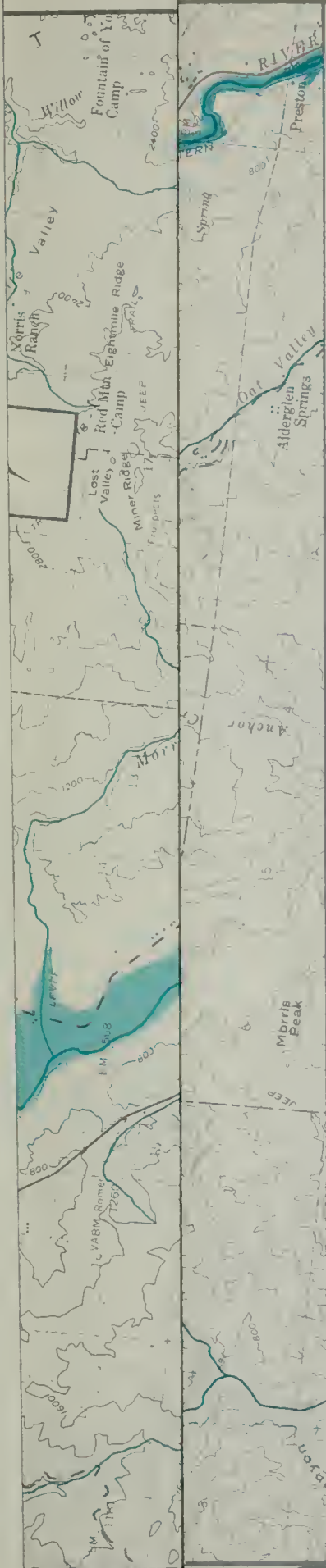
SCALE OF MILES



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FLOOD OF DECEMBER 1964
FLOODED AREAS
RUSSIAN RIVER
UKIAH — CLOVERDALE



LOCATION
MAP

LEGEND

Stream Gaging Stations

- ① E. Fk. Russian River nr. Ukiah
- ② Russian River nr. Ukiah
- ③ Russian River nr. Hopland



FLOODED AREA

SCALE OF MILES



STATE OF CALIFORNIA
THE RESOURCES AGENCY
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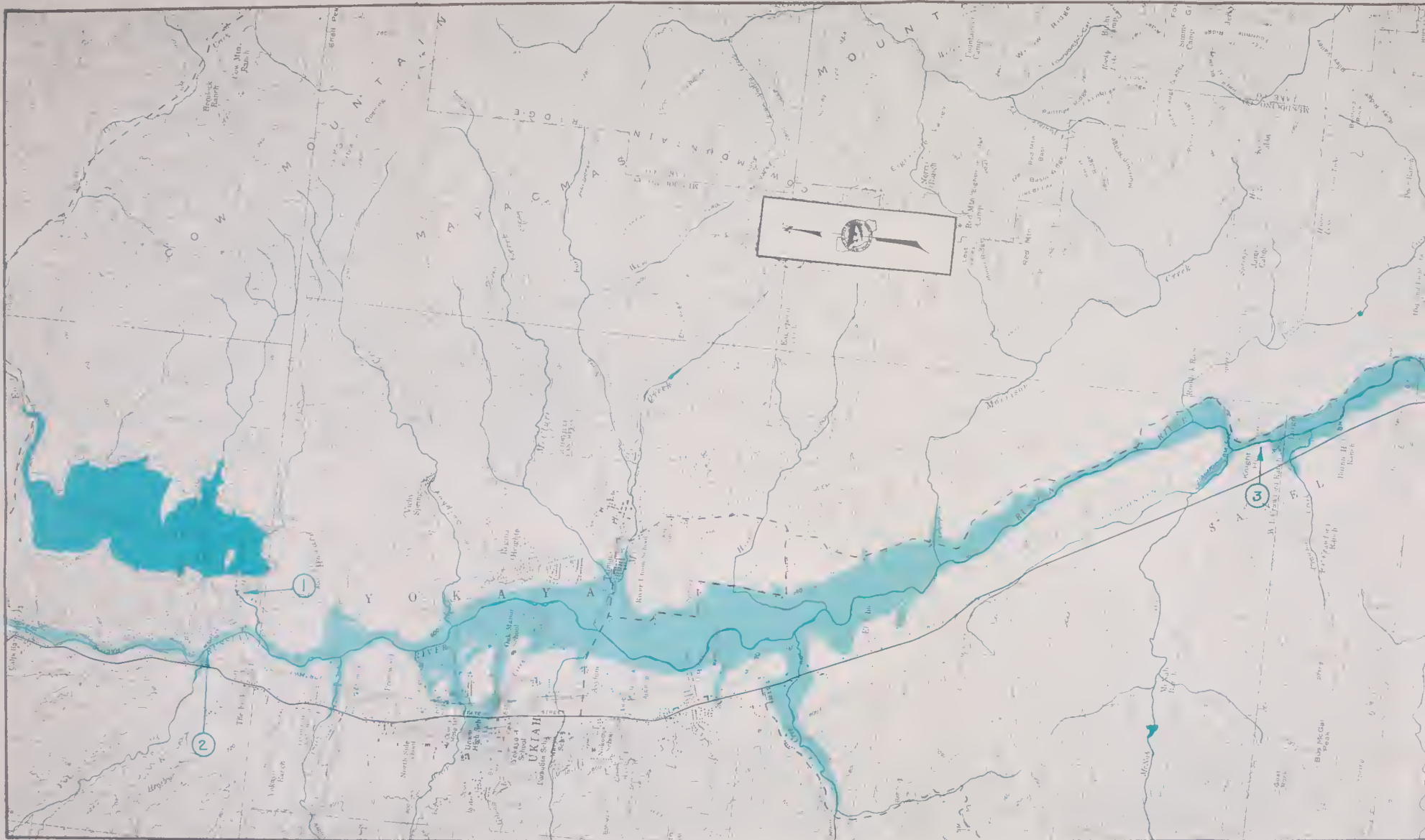


FLOOD OF DECEMBER 1964

FLOODED AREAS

RUSSIAN RIVER

UKIAH — CLOVERDALE



- ① E Fk Russian River nr. Ukiah
- ② Russian River nr. Ukiah
- ③ Russian River nr. Hopland

Stream Gaging Stations

① E Fk Russian River nr. Ukiah

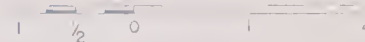
② Russian River nr. Ukiah

③ Russian River nr. Hopland



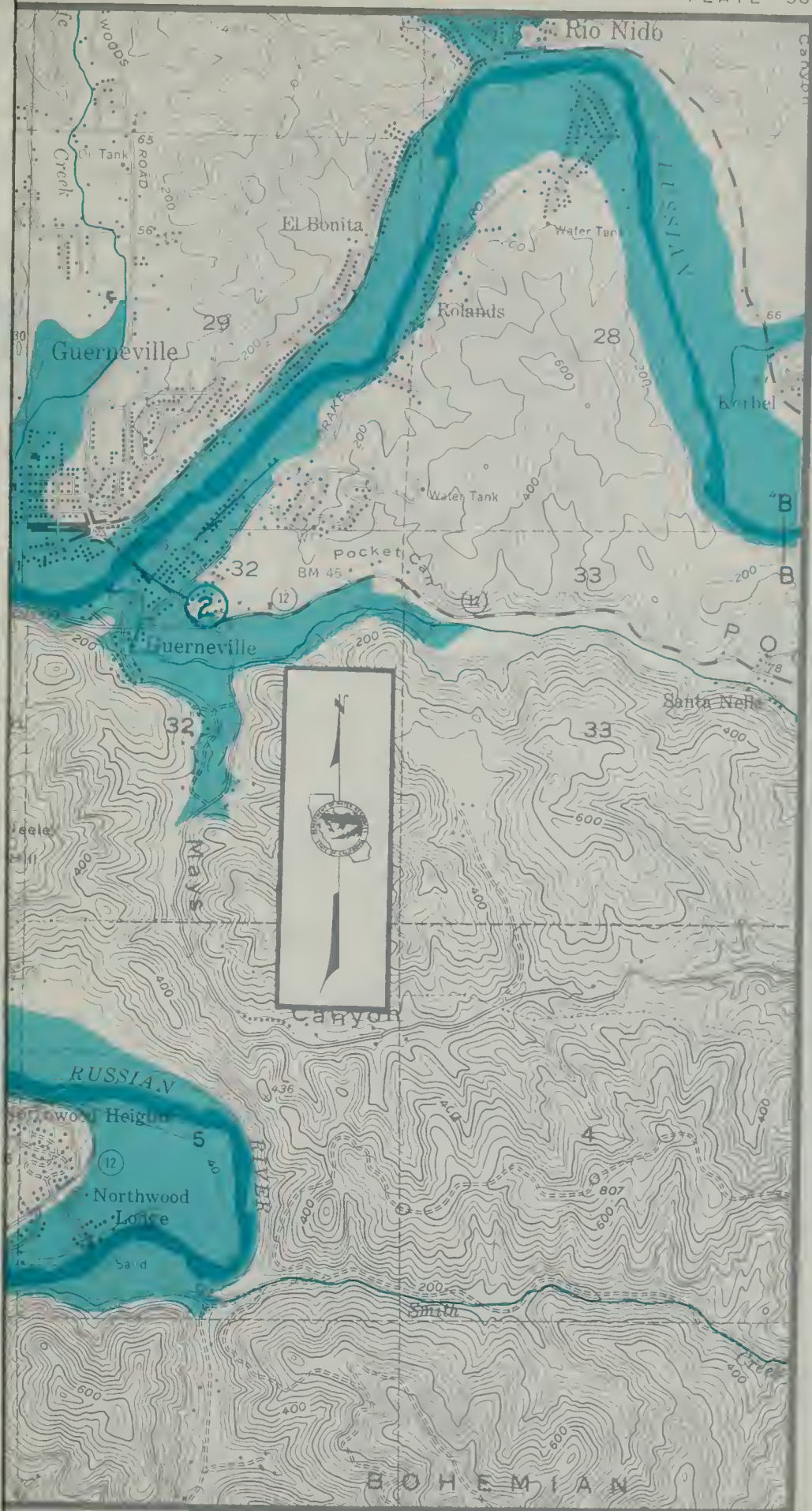
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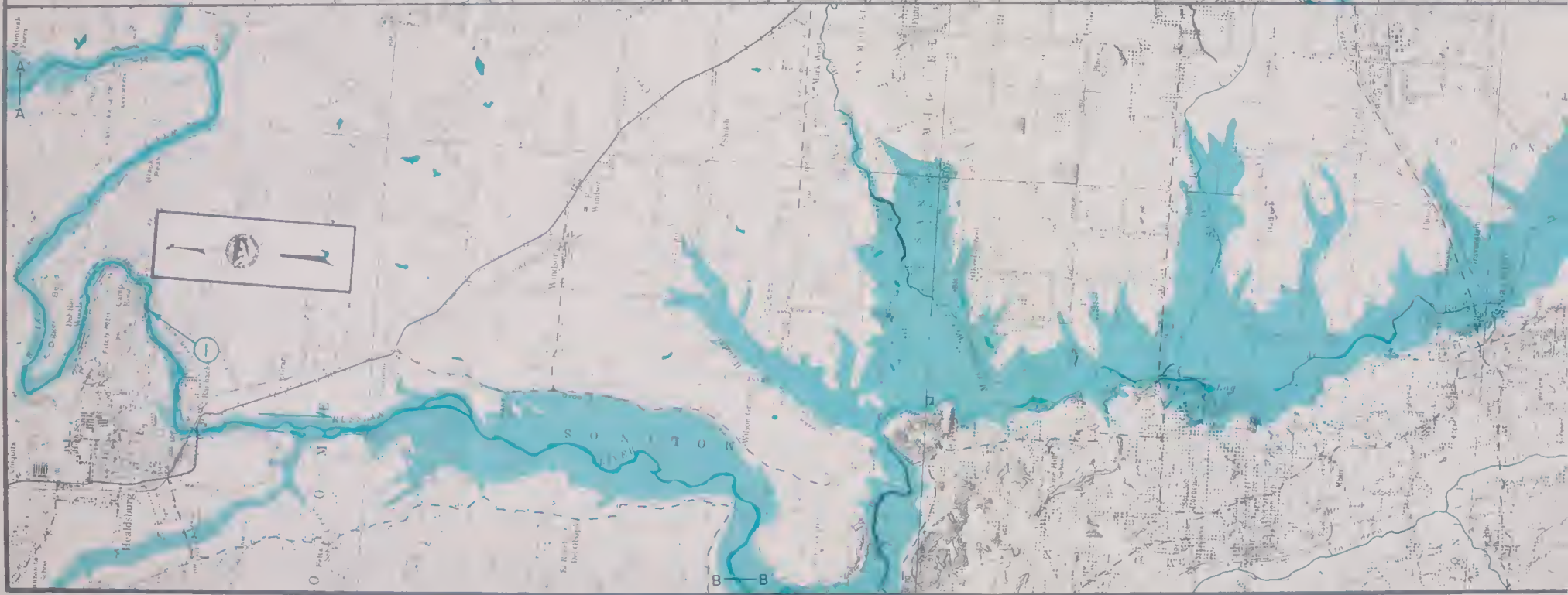
SCALE OF MILLS

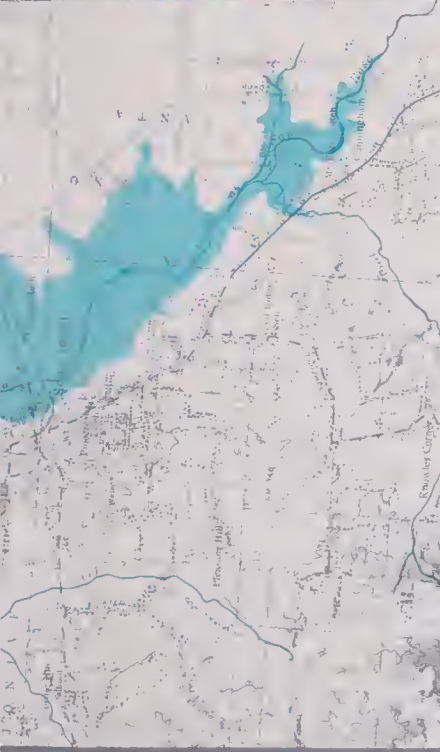
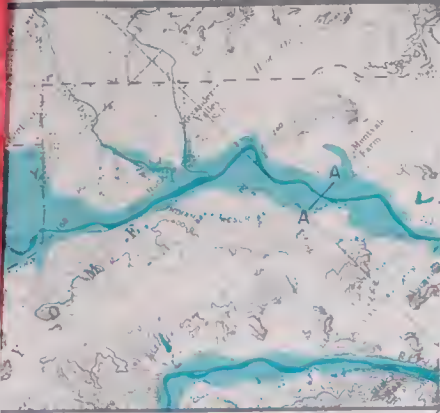


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FLOOD OF DECEMBER 1964
FLOODED AREAS
RUSSIAN RIVER
UKIAH — CLOVERDALE




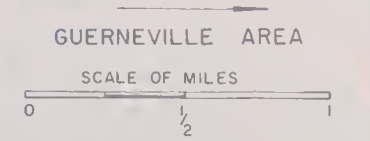




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FLOOD OF DECEMBER 1964
FLOODED AREAS
RUSSIAN RIVER

- LEGEND**
- ① - Russian River nr. Healdsburg Stream Gaging Station
 - ② - Russian River nr. Guerneville Stream Gaging Station
 -  FLOODED AREA





LOCATION
MAP

LEGEND

STREAM GAGING STATIONS

- ① Cottonwood Creek near Cottonwood
- ② Sacramento River at Red Bluff
- ③ Thomes Creek at Paskenta
- ④ Stony Creek near Hamilton City



FLOODED AREA

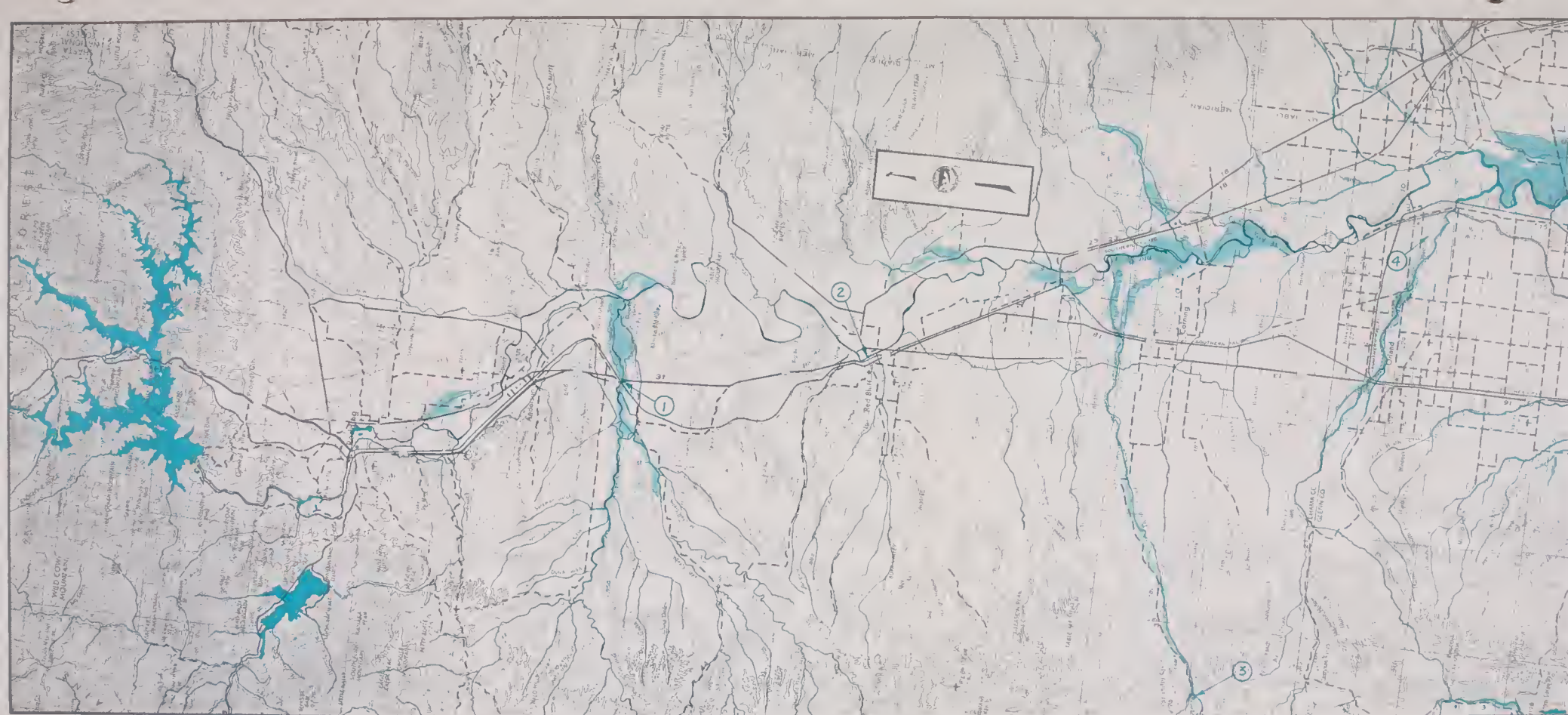


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FLOOD OF DECEMBER 1964

FLOODED AREAS
UPPER SACRAMENTO VALLEY



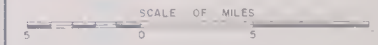
LOCATION
MAP

LEGEND

STREAM GAGING STATIONS

- ① Cottonwood Creek near Cottonwood
- ② Sacramento River at Red Bluff
- ③ Thames Creek at Paskenta
- ④ Slany Creek near Hamilton City

 FLOODED AREA



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FLOOD OF DECEMBER 1964

FLOODED AREAS
UPPER SACRAMENTO VALLEY



LOCATION
MAP

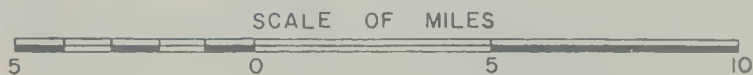
LEGEND

STREAM GAGING STATIONS

- ① Sacramento River at Ord Ferry
- ② Feather River at Yuba City
- ③ Sacramento River at Sacramento
- ④ Cosumnes River at McConnell



FLOODED AREA



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STATEWIDE OPERATIONS OFFICE



FLOOD OF DECEMBER 1964

FLOODED AREAS

LOWER SACRAMENTO VALLEY



LOCATION
MAP

LEGEND

STREAM GAGING STATIONS

- ① Sacramento River at Ord Ferry
- ② Feather River at Yuba City
- ③ Sacramento River at Sacramento
- ④ Cosumnes River at McConnell



FLOODED AREA



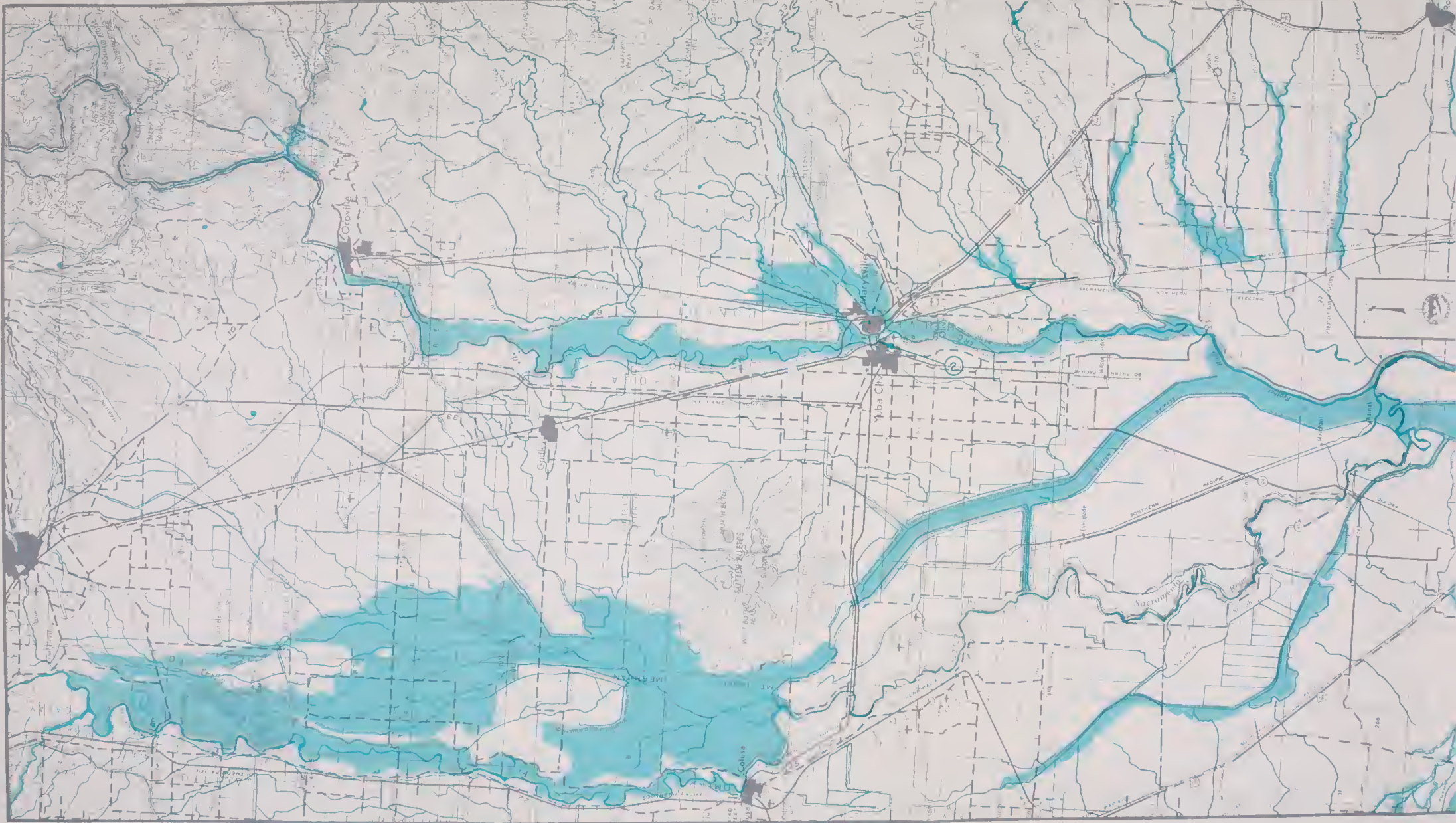
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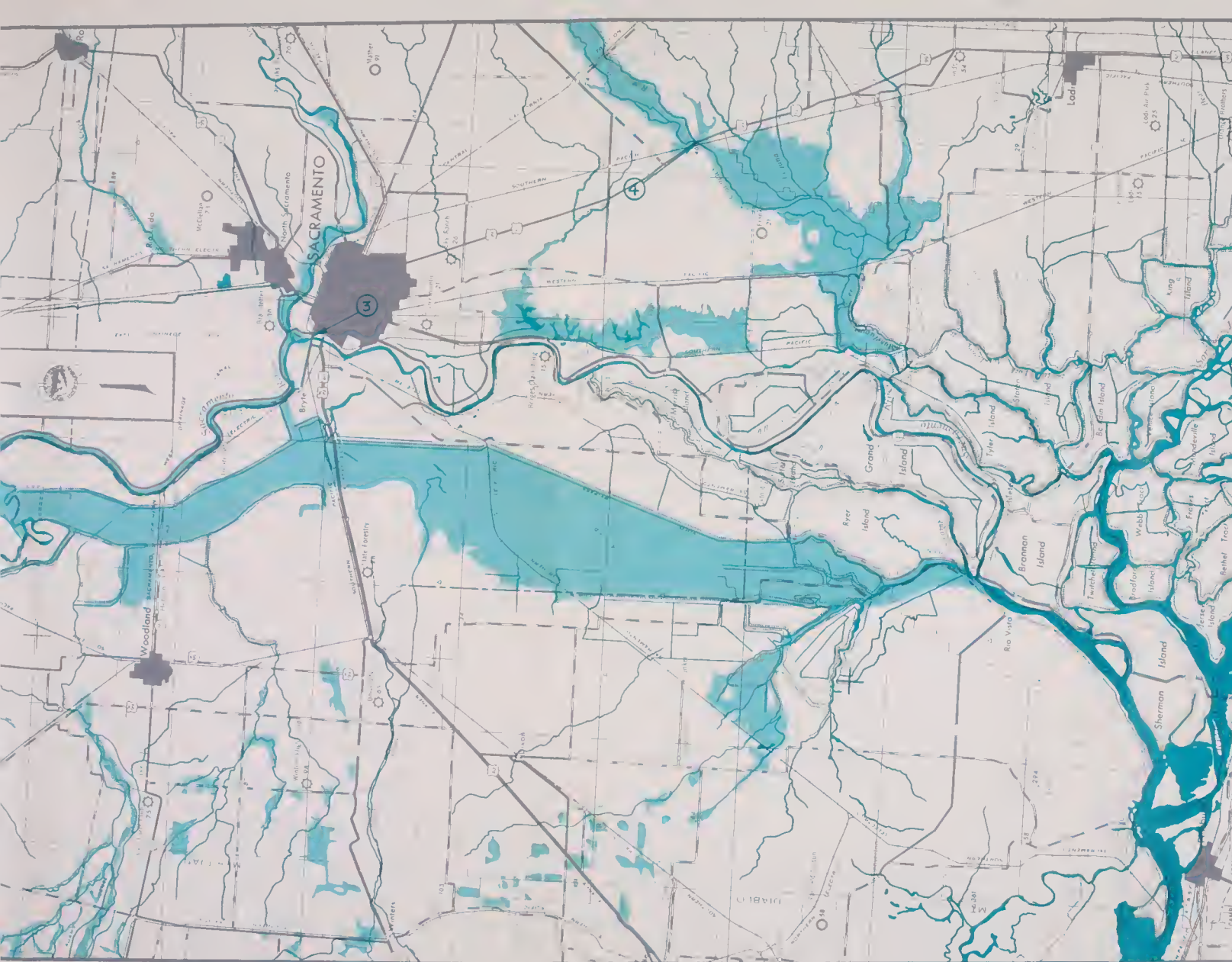


FLOOD OF DECEMBER 1964

FLOODED AREAS

LOWER SACRAMENTO VALLEY






LOCATION
MAP

LEGEND

STREAM GAGING STATIONS

- ① Sacramento River at Ord Ferry
- ② Feather River at Yuba City
- ③ Sacramento River at Sacramento
- ④ Cosumnes River at McConnell

 FLOODED AREA



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FLOOD OF DECEMBER 1964

FLOODED AREAS
LOWER SACRAMENTO VALLEY



LOCATION
MAP

LEGEND

STREAM GAGING STATIONS

- ① Sacramento River at Rio Vista
- ② Stanislaus River at Ripon
- ③ San Joaquin River at Newman
- ④ Merced River near Stevinson



FLOODED AREA



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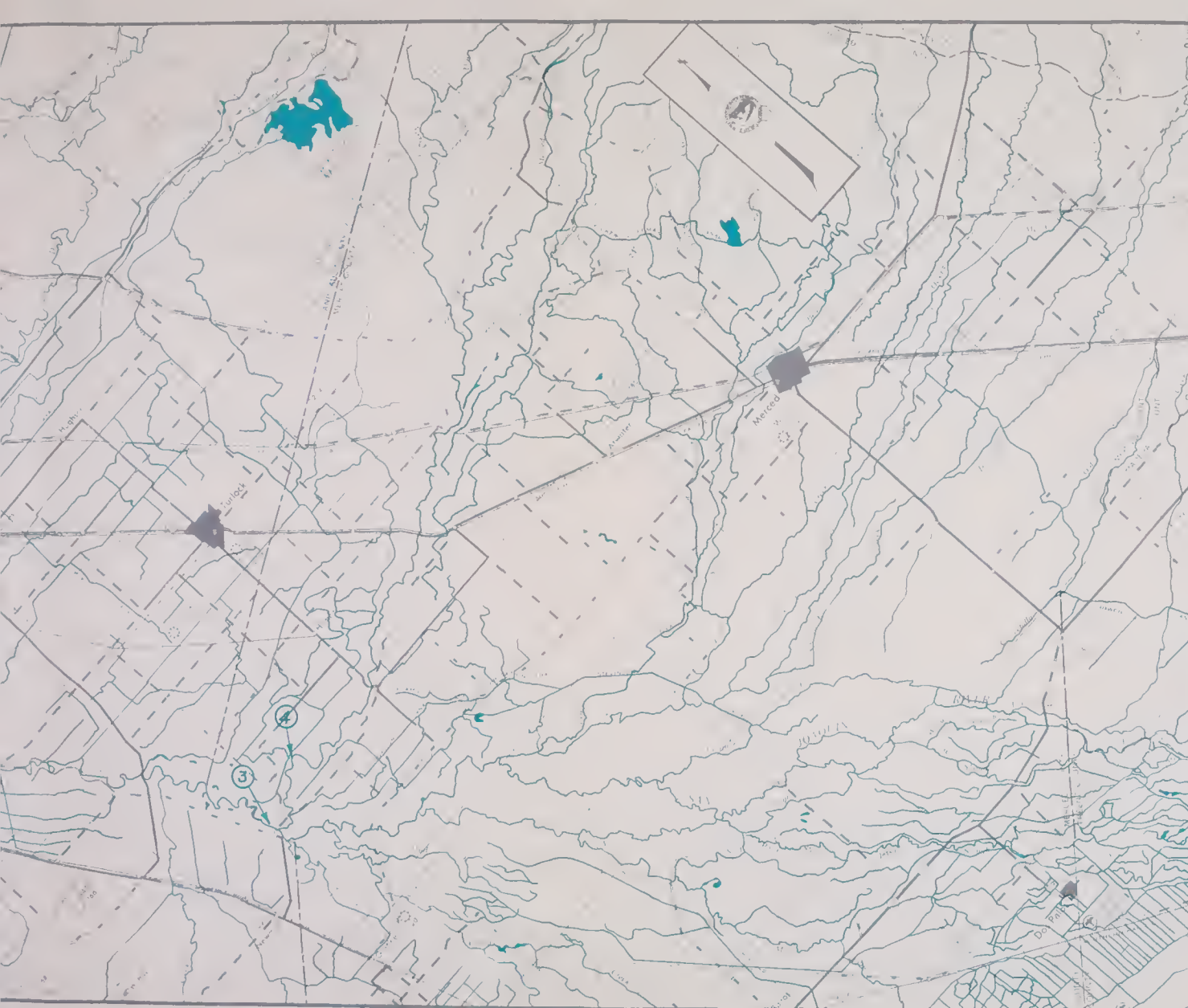


FLOOD OF DECEMBER 1964

FLOODED AREAS

SAN JOAQUIN VALLEY





LOCATION
MAP

LEGEND

STREAM GAGING STATIONS

- ① Sacramento River at Rio Vista
- ② Stanislaus River at Ripon
- ③ San Joaquin River at Newman
- ④ Merced River near Stevenson



FLOODED AREA



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SAN JOAQUIN VALLEY





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